CONSEIL PERMANENT INTERNATIONAL POUR
L'EXPLORATION DE LA MER
34 B. STRANDVEJ, HELLERUP. — DANEMARK

RAPPORTS
ET
PROCÈS-VERBAUX DES RÉUNIONS

VOLUME LXXXV

2ÈME PARTIE

RAPPORT ADMINISTRATIF

(1932—1933)

EN COMMISSION CHEZ
ANDR. FRED. HØST & FILS
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Juillet 1933.

NOTICE

The annual Procès-Verbaux des Réunions will in future be issued in two parts: 1° Report of Proceedings and 2° Administrative Reports, the latter to be issued as soon as possible after the Council Meeting, while part 1 will be printed as soon as approved by the editing committee and by the chairmen of committees.

The two parts are issued under the same volume-number and are intended for binding as one volume.

A third part containing appendices to the Area reports and papers read at the Committee meetings during the annual Council Meeting is appended.

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Copenhague — Imprimerie Bianco Luno A/S.

REPORT

of

ADMINISTRATION 1932—1933.

I. General.

position of the International Council for the Exploration of the Sea.

ring the year 1932—33 no changes have ccurred in the composition of the International cil in respect of adhering Governments. As ds Delegates the Council has suffered the loss e Danish Delegate, Professor JOHS. SCHMIDT, Vice-dent of the Council, in lieu of whom Dr. H. BLEGVAD een appointed Delegate for Denmark. Mr. GEO. RTH, Chairman of the Fishery Board for Scot- has replaced Professor D'ARCY W. THOMPSON cond British Delegate. No further change has reported at the date of going to press.[1])

Composition of the Bureau.

the Council Meeting in June 1932 Professor PETTERSSON retired from his post as Vice-dent of the Bureau after 30 years' service. In uncing his retirement he proposed Professor SCHMIDT as his successor. Professor SCHMIDT lected and the remaining members of the Bureau cted; the Bureau then consisted of:— Mr. H. G. ICE, President, Professor JOHAN HJORT, M. THÉO- TISSIER, Dr. C. HEINRICI and Professor JOHS. IDT until the death of Professor JOHS. SCHMIDT bruary 21st 1933. The vacant Vice-Presidentship ot yet been filled.

the motion of M. THÉODORE TISSIER. Professor PETTERSSON was appointed Président d'HONNEUR e Council.

Committees.

st of the Committees will be found in the Procès- ux of the last Council Meeting. All these Com- es remain in being and continue their activities.

Audit of Accounts.

Accounts of the Council for 1931—32, audited qualified accountant and examined and found correct by the Finance Committee, will be submitted to the Council for final approval.

An Income and Expenditure Account is given below of the Accounts for 1932—33 which have to be examined by the Finance Committee.

After consultation with the auditors it has been decided by the Bureau to present the Accounts in a new and more detailed form so as to give a better review of the Council's affairs.

The most important alteration from the old presentation is that the form now adopted shows the actual Income and Expenditure for the year instead of a simple extract of the Cash Accounts. At the same time several headings have been set out in more detail for the convenience of the Council.

Hitherto the pensions paid have been stated as extraordinary expenditure but the Bureau has decided in future to pay pensions out of the Pension Fund and to refund from the revenue to the Pension Fund such payments; — a special Pension Fund Account showing income and expenditure will be presented in future.

In addition to the Income and Expenditure Account a Balance Sheet showing a complete statement of the Council's Capital, Assets and Liabilities on the 1st of April will be presented.

Meetings.

Meetings of the Bureau attended by all the members were held in Copenhagen in June and in London in November 1932. At the Bureau Meeting in London a Sub-Committee for consideration of a new edition of the Statutes was appointed consisting of the President, M. THÉODORE TISSIER and Dr. HEINRICI. This Sub-Committee met in Paris in February. A further Bureau Meeting attended by all members and Professor PETTERSSON, Président d'HONNEUR, was held in Copenhagen in April 1933. The Administrative Secretary was present at all meetings.

A meeting concerning the technical methods for the racial study of the tunny was held in Madrid and Cadiz in May 1932. The meeting was attended

[1]) t the meeting in Paris, May 1933, the following was announced: Belgium: M. H. DE VOS was ted Delegate, Professor G. GILSON acted as second te.

Preliminary
Income and Expenditure Account for the year ending March 31st 1933

EXPENDITURE

	Estimates	Expenditure	
I. Incidentals			
1 President		5,700.00	
2 Chairman of Editorial Committee	*16,150.00*	1,900.00	
3 Hydrogr. Consultant		2,850.00	
4 Editor of Statistics		1,900.00	
5 Editors of Journal		3,800.00	
			16,150.00
II. Administrative Staff			
6a Adm. Secretary Capt. Schøning $^{1}/_{4}$—$^{21}/_{7}$ 1932		4,045.16	
6b Adm. Secretary Capt. Nellemose $^{1}/_{6}$—$^{31}/_{3}$ 1933	*24,528.49*	6,666.67	
7 1st Asst. Secretary		5,600.00	
8 2nd — —		4,350.00	
9 Statistical —		3,866.66	
			24,528.49
Hydrographic Staff			
10 Hydrographer		5,600.00	
11 Hydr. Secretary	*12,133.33*	2,800.00	
12 — Assistance		2,432.60	
13 Clerical Secretary		1,120.00	
			11,952.60
III. Office Expenditure			
14 Rent		4,500.00	
15 Clerical Assistance		1,800.00	
16 Light and Heating		1,126.95	
17 Stationary, books etc.		1,385.18	
18 Teleph., Telegr., Postage etc.	*14,000.00*	1,440.84	
19 Furniture and Fittings (new)		270.00	
20 Insurance		177.15	
21 Upkeep, Cleaning, Rep.		2,006.64	
22 Miscellaneous (incl. expenses at meetings)		1,145.44	
			13,852.20
23 **IV. Travelling Expenses**	*15,000.00*		13,736.03
V. Chairmen of Committees			
24 N.E. Area (Chairman and Vice-chairman)		5,700.00	
25 N.W. Area		2,850.00	
26 Atlantic Slope (Chairman and Vice-chairman)		5,700.00	
27 Combined North Sea	*29,550.00*	1,900.00	
28 Northern —		2,850.00	
29 Southern —		2,850.00	
30 Transition Area		2,850.00	
31 Baltic Area		2,850.00	
32 Salmon & Trout Comm.		1,000.00	
33 Plankton Committee		1,000.00	
			29,550.00
VI. Printing and Distribution			
34 According to Estimate.	*45,000.00*	38,645.90	
35 Bureau Resolution (O. Pettersson)	*0.00*	1,144.67	
			39,790.57
To carry forward...		Kr.	149,559.89

INCOME

		Estimates		Income	
I. Annual Contributions					
Participating countries:					
France	1932—33	*20,000*	20,000.00		
Germany	—	*20,000*	20,000.00		
Great Britain	—	*20,000*			
Spain	—	*20,000*			
Belgium	—	*10,000*	10,000.00		
Denmark	—	*10,000*	10,000.00		
Holland	—	*10,000*			
Norway	—	*10,000*	10,000.00		
Poland	—	*10,000*	10,000.00		
Sweden	—	*10,000*	10,000.00		
Finland	—	*5,000*	5,000.00		
Irish Free State	—	*5,000*	5,000.00		
Portugal	—	*5,000*			
Other countries:					
Latvia	1931—32	*2,000*	2,000		
		157,000			102,000.00
II. Outstanding per $^{20}/_{4}$ 1933					55,000.00
III. Interests on Bank Deposits		*1,500*	1,516.74		
Interests on Investments		*6,000*	6,000.00		
		7,500			7,516.74
IV. Sale of Publications		*2,500*			1,996.81
		165,000			166,513.55
To carry forward...				Kr.	166,513

[1]) The difference between this figure and "Sundry Debtors" in Balance Sheet is caused by payments of Finland and Irish Free S after April 1st.

	Estimates	Expenditure	
	Carried forward...	149,559.89	
I. Extraordinary Expenditure			
pecial Resolutions:			
uppl. Binding of Books	*200.00*	200.00	
ompensation for double rent paid to the new Adm. Secr. on account of short notice.....	*660.60*	660.60	
iches Faunistiques....	*9,000.00*	9,000.00	
rof. JOUBIN's Honorarium (Fiches Faun.) .	*1,000.00*	1,000.00	10,860.60
	167,222.42		160,420.49
II. Pension Fund			
ransferred according to Standing Resolution.	*3,500.00*		3,500.00
efund of Pensions paid	*9,967.73*		9,967.73
Total Expenditure...	*180,690.15*		173,888.22

	Income
Carried forward...	166,513.57
Excess of Expenditure over Income	7,374.65
Total Income...	Kr. 173,888.22

Pension Fund

EXPENDITURE		
DRECHSELS pension	6,500.00	
SCHØNINGS pension	3,467.73	
		9,967.73
ce at March 31st 1933.....		28,578.77
		Kr. 38,546.50

INCOME	
Balance at April 1st 1932.....	23,804.84
Transferred from Revenue	3,500.00
— to refund Pensions paid	9,967.73
Interests accumulated.....	1,273.93
	Kr. 38,546.50

Balance Sheet 31st March, 1933.

LIABILITIES		
l Reserve:		
Balance per April 1st 1932...	231,391.75	
Excess of Expenditure over Income.....	7,374.65	
Balance as per $^{31}/_{3}$ 1933		224,017.10
Pension Fund.....		28,578.77
Sundry Creditors as per $^{31}/_{3}$ 1933		4,303.34
		Kr. 256,899.21

ASSETS		
Cash at Bankers	40,893.19	
— - Savingsbank	3,401.77	
— in hand	482.05	
		44,777.01
Danish Treasury Bonds at cost (nom. value Kr. 120,000; market value at $^{31}/_{3}$ 1933 Kr. 123,600)..		118,543.43
Pension Fund		
Cash at bankers.....	99.21	
Danish Treasury Bonds at cost (nom. value Kr. 28,800; market value at $^{31}/_{3}$ 1933 Kr. 29,664)...	28,479.56	
		28,578.77
Sundry Debtors as per $^{31}/_{3}$ 1933		65,000.00[1])
		Kr. 256,899.21

[1]) Furthermore Rbl. 14,430.54 (Russian Contr. 1914/15) deposited in a Leningrad Bank from which it has not yet been possible to withdraw it.

by Professor F. DE BUEN, Spain, M. G. BELLOC, France, and M. F. FRADE, Portugal, designated by the International Council and Dr. ED. LE DANOIS, France, M. M. SELLA, Italy and M. H. HELDT, Tunis, designated by the International Commission for the Mediterranean. A full report of the meeting is printed in the Rapport Atlantique (Vol. LXXXIV, p. 92).

As stated in last year's Procès-Verbaux (Vol. LXXXI, p. 17) it was resolved that a meeting of experts for examining the possibility of the adoption of standard methods for the sanitary control of shellfish should be held. This meeting took place in Middelburg on September the 20th and was attended by the following experts as representatives of their country and travelling at the expense of the Council:— Professor DAMAS, Belgium, Mr. DODGSON, Great Britain, Professor HINARD, France, Professor HAGMEIER, Germany, Professor BIGGER, the Irish Free State, Dr. TESCH, the Netherlands and M. Bô Portugal. Others present were Dr. TIMBALE, Belgi and Drs. GRIJNS, HAVINGA and LIEBERT, the Neth lands.

The report issued after the meeting is printed Appendix I hereto.

According to a resolution of the Council (Proc Verbaux Vol. LXXXI, p. 43) a meeting of memb and experts of North Sea Committees was held October 11th, at Lowestoft. The meeting was atten by Mr. BUCHANAN-WOLLASTON, Dr. RUSSELL, HODGSON, Mr. LUMBY, Mr. SAVAGE, and Mr. DA England, M. J. LE GALL, France, Dr. TESCH, Netherlands, Professor GILSON, Belgium and GILIS as guest.

The report issued after the meeting is printed Appendix II.

II. Work of the Office at Copenhagen.

Besides administrative work, correspondence, etc. the following work has been carried out:—

A. Publications.

Report regarding publications issued and cost of same during the financial year 1932—33.

Series	Volume	Pages	Subject	Estimated	Cost	Remarks
Rapports et Procès-Verbaux	LXXIX	70	Carbonic Acid Investigations	*2,000*	2,052.53	
—	LXXX	96	Scientific Meetings 1932	*2,800*	1,715.15	
—	LXXXI	236	Procès-Verbaux	*3,700*	4,788.33	
—	LXXXII	36	Interne Gezeiten Wellen	—	1,144.67	Bureau Resolu
—	LXXXIII	38	Experiments with Plankton nets	*900*	939.86	
—	LXXXIV	104	Rapport Atlantique	*2,000*	2,202.70	
—	—		North Western Area Report	*2,500*	—	Postponed
Bulletins		136	Bull. Hydrographique for 1931	*4,500*	5,198.00	
—			Offprints	*600*	438.75	
—	Annexe I	64	Investigation of Submarine Waves in Cattegat	*4,000*	2,416.25	
—		64	Density tables	*1.500*	1,522.00	
—	Annexe II	32	Atlas of t° & S °/₀₀ in North Sea and English Channel	*3,900*	1,695.00	
—	XX	122	Bull. Statistique	*2,800*	2,984.99	Cost includes to contribute translations blocks etc.
Journal du Cons.	VII, nos. 1-3	450		*8,000*	8,686.18	
			Extract, Fish marks...		178.00	
			Total...	*39,200*	35,962.41	
			Other costs of publications:—			
			Translations, etc.	*2,300*	1,300.48	
			Distribution	*3,500*	2,527.68	
			Grand Total...	*45,000*	39,790.57	

B. Hydrographical Department.

In addition to the usual work with recording of meetings and protocols of the Hydrographical Committee the Service Hydrographique has this year been engaged with the final work on Temperature and Salinity means of surface water in the North Sea and the English Channel and with the final checking of the entire material before going to press with the charts. In addition hereto a report on the methods employed in preparing the ch has been made and will be submitted to the relev Sub-committee at this year's Council Meeting. charts will be presented printed as Manuscript this Meeting.

The Publication of observations collected du the Cattegat expedition has occupied a c siderable part of the Service Hydrographique's ti

entire material has been carefully checked and caused a fairly extensive correspondence on ious questions. The publication took place in rch this year.

he final preparation of Mr. MATTHEWS' Density bles was attended to; the tables were published December, 1932.

s regards Bulletin Hydrographique for 31 this was issued in December 1932 and the detment has undertaken the preparation of the erial as customary. The material collected for 1932 issue has been checked on arrival, positions rked on charts and observations compared with ier observations from the respective positions. ere doubt has been present as to the correctness the observations enquiries have been made as he possibility of errors in compiling lists.

hecked lists have then been handed to the Adistrative Secretary for further treatment owing an arrangement between the Hydrographic Conant and the Administrative Secretary according which all routine work of non-technical or non-scientific kind is now being done by the administrative staff in order to release the department for purely technical work. This arrangement has now been in force for some 8 months and seems to work satisfactorily.

Part of this work is the monthly distribution of lists of observations collected in the North Sea. Those lists were previously printed but are now circulated type-written — an arrangement which means a considerable saving of expenditure.

Some experiments have been made in order to find the best possible way of issuing records of Norwegian thermogrammes and a report will be presented at the meeting of the Hydrographical Committee. In accordance with the recommendation last year, Ireland, England and Belgium have forwarded samples of sea-water for control-titration under supervision of the hydrographer.

The department has furthermore been in constant touch with various institutions and persons on hydrographical matters.

C. Statistical Department.

he Bulletin Statistique for the year 1930 was lished in Sept. 1932, and the work on the Statfor 1931 has been carried on during the year —33.

he monthly tables relating to the Herring Fisheries been continued for the year 1931; but in conity with the resolution of the Statistical Comee no charts have been worked out for this year. pursuance of the recommendation of the Comee the Bureau has tried to obtain more satisfactory information as to the Salmon and Trout Fishery from certain countries of importance in this connection, but though some information has been received from England and Scotland the data about the Salmon and Trout Fishery is still unsatisfactory.

The material for the Bulletin for 1931 has been worked out and tabulated, but as no information from Iceland has been received it will not be possible to lay proof-prints before the Committee at its next meeting.

APPPENDIX I.

Report on Meeting of Shellfish Experts

at Middelburg, 20th—22nd September, 1932.

Protocol.

he Meeting of the International Council on h. 28th, 1931, (see Rapp. et Proc.-Verb. d. ions, Vol. LXXIV, 1931, p. 22—23) it was ed that a conference on the subject of sanitary ol of shellfish should be held, with the view to final adoption of a standard method of bacogical survey of edible molluscs, especially of rs and mussels.

e undersigned was requested to act as convener is conference, which was to deal with the matter e next Council Meeting.

It was afterwards decided, however, that, as it would be difficult to find time for this conference during the Council Meeting, the Shellfish Experts should meet independently of the annual gathering of the Council, and, at the suggestion of Dr. TESCH, it was agreed that they should meet at Middelburg in the month of September, 1932.

Denmark, Germany, Holland, Belgium, England, Irish Free State and France agreed to send Experts to the meeting.

The meeting took place in the Town Hall at Middelburg on September 20th, 1932, at 9.30 a.m., when the following Experts were present:—

England: Dr. R. W. Dodgson, Mussel Purification Station, Conway, Caernarvonshire.
Irish Free State: Prof. J. W. Bigger, Dublin University.
France: M. G. Hinard, Prof. Dienert, Office Scientifique et Technique des Pêches Maritimes, 3, Avenue Octave Gréard, Paris.
Portugal: M. Rodrigo Bôto, Acquario Vasco da Gama, Dafundo.
Belgium: Prof. D. Damas, University of Liège.
Dr. Timbal, Dir. Gen. d. Serv. de l'Hyg. au Min. de l'Intérieur.
Germany: Prof. A. Hagmeier, Staatl. Biol. Anstalt, Helgoland.
Holland: Dr. A. Grijns, Bact. de l'Adm. Zéland d. Pêches, Bergen op Zoom.
Dr. F. Liebert, Dir. de l'Inst. Gouv. de l'Examen chim. microbact. et hydrograph. d. Pêches, den Helder.
Dr. B. Havinga, Chef de la Sect. Pêche Côt. de l'Inst. Gouv. de l'Examen biol. d. Pêches.
Dr. J. J. Tesch, Chef de la Sect. Pêche Mar. de l'Inst. Gouv. de l'Examen biol. des Pêches.

Dr. Tesch welcomed the visitors on his own behalf and on behalf of the Minister of Economic Affairs and Labour, who was prevented from being present personally, and referred briefly to the initiative of the International Council in calling this meeting. After passing a vote of thanks to the Burgomaster of Middelburg, who had granted the use of the Town Hall, the Committee proceeded to the discussion of the various methods of bacteriological control used in each country. Successively these methods in use in England (Conway), Irish Free State, France and Holland were explained by the Experts concerned, in the following order:—

a. taking of sample, and inoculation
b. choice of nutritive medium
c. demonstration and testing of bacteria, considered to be *coli* according to their characteristics.

As to *a* it appeared that thorough mixing of the fluid obtained from the shell water and of the mollusc body took place in different ways, if several molluscs were taken together for examination. It was agreed that it would be better to examine the molluscs separately and to take samples of the fluid in various degrees of dilution with sterile water. Also the way of cleansing the mollusc before opening is subject to critisism; in order to avoid any further contamination the mollusc is to be brushed and rinsed in sterile water — or, alternatively, covered with a thin layer of collodion, to fix any bacteria adherent to the shell.

The choice of nutritive medium for cultivating bacteria (as under *b*) differs in different countries. Lactose, glucose or phenol are mostly used; pepton being added as protein food. It was agreed that a solid medium should be preferred and tha a new medium, that of Salle, rather recentl discovered, should be tried and experimente with in each country concerned, side by sid with the habituel method of bacteriologica control of molluscs in that country.

Finally the testing of bacteria, developing on definite nutritive medium, as mentioned under appears to be dependent on certain chosen charac teristics of these bacteria, according to which qualitie they might be styled *coli* or not. France relied on th development of indol; England (at Billingsgate) an Irish Free State on that of gas and acid; at Conwa purified mussels were judged after the presence "Lactose fractors"; Holland tested the bacteria o several lines (Gramnegative coloration, developmen of gas and acid, and morphological characters).

Portugal stated that recently a systematic surve of oyster beds had been started, but that as yet n definite method had been established. Certificate of salubrity were already being delivered.

In Germany no bacteriological control of oyste or mussel beds took place.

The Belgian delegates expressed their interest an their appreciation of the discussions, but were a yet unable to provide information; as a matter fact, however, artificial oyster culture (fattening seed oysters) had just been started at an establish ment near Newport, under the auspices of the Goverr ment.

In the afternoon Prof. Hagmeier gave a lectur on oyster larvae, their rearing in aquaria, the in fluence of temperature on their growth (if the ten perature is abnormally low the oyster may retai its larvae up to a size of 210 μ) and the size of thes larvae (270—300 μ) at the time of their settlin down. He also demonstrated drawings (partly i natural colours) and microscopical preparations oyster larvae of various sizes.

A thermostate of the firm "Inventum" at Bilthover in which the constant temperature desired (betwee 20° and 80° C.) was to be obtained by a simple devic was demonstrated by one of the firm's representative

The next day, September 21st, was devoted to discussion of the method of cultivating on Salle medium, some preliminary experience of which ha been gained already. This proceeding, to be tried a control, together with the habitually establishe method, was adopted by the experts of the countri concerned. A uniform way of working, in order t get comparable results, was (in the afternoon) pu down by Prof. Bigger, and (in the evening) discusse and agreed to. This chief resolution of the meetin will be treated in the next chapter. It was the gener opinion that a new conference, in which the resul obtained by Salle's method as a control could b compared and discussed, should take place in du time.

M. Hinard read a recommendation adopted at th Congrès International d'Aquiculture et de Pêche Paris, in July 1931, in which uniformity and sta

ardisation of bacteriological control of shellfish was eclared to be highly desirable, notably in connection th the validity of certificates of salubrity.

It was agreed that collaboration in this matter th other countries, non adherent to the International ouncil, would be of great importance.

The rest of the available time was devoted to some scussion of oyster parasites and notably of the pper limpet. About this mollusc Dr. DODGSON gave eful information, chief of which appeared to be e experience hitherto gained that these pests nnot stand staying out of water for more than 12 urs, provided the temperature is not too low. ch of the mode of living of the limpets is still known. In Zeeland waters the limpets seem to ve multiplied to a great extent, since they were dvertently introduced four years ago. In France, wever, the *Crepidula* appeared to be absent ogether.

The undersigned finally thanked all those present the information received, expressed his satistion of having arrived at a practical result and t a special vote of thanks to Dr. A. GRIJNS, for om no practical arrangement for this meeting had en too much.

On Thursday, September 22nd, the participants k an early train to Bergen op Zoom, visited there laboratory of Dr. GRIJNS (where the latter denstrated his method of taking samples and of tivation and where Dr. DODGSON showed his way covering the mussels, before bacteriological mination, by a thin sheet of collodion) and then t to an oyster establishment in the neighbourod. Afterwards they embarked on the police amer "Voorwaarts", inspected several oyster pits Yerseke and returned to Middelburg.

On Friday, September 23rd, several of the particits availed themselves of the opportunity, offered Prof. DAMAS, and greatly facilitated by the dness of Messrs. VLAMING and NOLET, oyster eders at Yerseke, who put private cars to their posal, to visit the new experimental oysterstation Newport, where oysters are being fattened either horizontal or in vertical trays, and where seed ters from Zeeland showed a most remarkable wth after some summer months. This experiment eing conducted under the auspices of the Belgian vernment.

J. J. TESCH.

II. Resolution.

The Shellfish Expert Meeting at Middelburg, 20—21 Sept. 1932, agreed to control their own method of bacteriological examination of shellfish as established in the country concerned by the new method of cultivation of bacteria on the medium of Salle, the composition of which has been stated to be (according to information of Prof. DIENERT[1]):

I.	pepton	5 gr.
	distilled water	1000 cm³.
	agar	20 gr.
	lactose	10 gr.
II.	Monobasic kalium phosphate	1 gr.
	Dibasic — —	5 gr.
III.	Erythrosine à 2 %	20 cm³.
	Methylene blue à 1 %	10 cm³.
	Purple bromocresol à 1 %	20 cm³.

B. They further agreed, in order to get comparable results, to adhere strictly to the following rules, as proposed by Prof. BIGGER:—

Investigation into the use of Salle's medium in comparison with other methods for the bacteriological examination of Shellfish.

In order to render the results obtained by various bacteriologists in different countries comparable I beg to suggest the following rules to be followed by all.

1. A sample of mussels (or oysters) shall consist of 10 mussels, each of which is to be examined quite separately.
2. In order that the results obtained may represent the bacteriological condition of the mussels when collected (whether from beds, tanks or markets) they are to be collected and handled in such a way as to avoid any further contamination at any time between collection and examination. The sample is therefore to be placed at once in a sterile tin (or each mussel in a separate sterile tin) for transportation to the laboratory.
3. In the laboratory the shells are to be cleaned by scrubbing in tap water and rinsing in sterile water or alternatively the collodion method of DODGSON may be used.
4. The shell of each mussel is to be opened with a sterile knife.
5. Since the shell fluid is variable in quantity (from zero upwards) and in bacteriological quality (as it is little more than a sample of the sea water in which the mussel lay when it last opened and its bacterial content is to a large extent independent of that of the body) the shell fluid is to be rejected and not examined.

   This rule will not prohibit those who wish to examine shell fluid from doing so, but such examinations shall be considered as separate from the main investigation.

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[1]) The "Zentralblatt für Bacteriologie", Abt. II, Bd. 84, 1931, p. 141 gives a different relative proportion of the components (the quantity of bromocresol purple is here only given as 2 cm².), and it is stated that this purple, in turning into orange by the growing of colonies of *B. coli*, but not changing colour by the growth of *B. aerogenes*, permits discrimination between the two kinds of bacteria.

6. The body of each mussel shall be transferred as completely as possible to a separate sterile graduated vessel in which it shall be finely minced with scissors. To this material shall be added sufficient sterile saline to make the total volume up to 25 cm^3.

   Obviously the volume of saline added will vary considerably depending on the volume of the body, but not more than would the volume of shell fluid under various conditions (duration of keeping etc.).
7. The minced mussel and saline shall be thoroughly mixed with a sterile rod, and the mixture taken as representing one mussel of a standard volume of 25 cm^3. for body and shell fluid combined.
8. Measured amounts of the mixture shall be implanted in Salle's medium (or other media) and shall be incubated at 37°.
9. *B. coli* shall be enumerated and results shall be expressed per mussel. If, for example, 5 colonies of *B. coli* were obtained from 1.0 cm^3. of the mixture, the result would be reported as $5 \times 25 = 125$ *B. coli* per mussel.
10. As many as possible (and in any case not less than 2 from each mussel) of the colonies of presumptive *B. coli* on Salle's medium shall be subcultured and tested.
11. The characteristics of typical *B. coli* are to be taken as:—
    a. Gram negative bacilli
    b. Producing acid and gas from lactose
    c. — — — — — glucose
    d. — indol
    e. Giving a positive methyl red test
    f. — - negative Voges-Prostzauer test
    g. Not growing on Koser's citrate medium.

Any organism having the characteristics *a*, *b* and *c* and at least three of the four characteristics *d*, *e*, *f* and *g* is to be taken for this investigation as a faecal *B. coli*.

JOSEPH W. BIGGER.

APPENDIX II.

Meeting of Herring Experts at Lowestoft.

11th October 1932.

The meeting took place on Tuesday, 11th October, at 2.30 p.m. in the Fisheries Laboratory.

Were present:

Mr. WOLLASTON
Dr. RUSSELL
Dr. HODGSON
Mr. LUMBY
Mr. SAVAGE
Mr. DAVIS
Dr. LE GALL
Dr. TESCH
Prof. GILSON
Mr. C. GILIS — as guest.

It was not intended that this meeting should be a Committee meeting but simply an informal encounter between workers engaged in a definite herring study in the southern part of the North Sea. However, as several points to be discussed require the agreement of several Governments, it was decided that it would take the form of a sub-sectional meeting of the Combined North Sea and Eastern Channel Committee.

Dr. RUSSELL proposed that Professor GILSON take the chair.

The Chairman opened the meeting.

He reminded the assembly that the aim of the meeting is double:

1) To organise simultaneous observations in order to establish the hydrographical conditions actually prevailing in a definite part of the Southern North Sea and the Eastern part of the Channel. This work ought to be performed as quickly as possible and the data collected communicated to the laboratories of Lowestoft, Boulogne, the Hague and Ostend. As soon as the results of that particular hydrographical survey are obtained, fishery observations are to be carried out at certain places, either by research ships or by means of the collection of samples from fishing boats recorded as having been fishing at well determined times and places.

This scheme of simultaneous operations should be divided among the several countries interested and is intended to be occasional, non continuous work, although it may prove desirable to repeat it once or twice in the course of the herring fishery of the year.

2) To propose a plan for continuous hydrobiological observations across the Southern entrance of the North Sea in order to seize as soon as possible any change of the hydrographical conditions in the limit region between Channel and North Sea, and supply immediate data to the students of fishery questions, in combination with the continuous observations made on the Varne, Sandettie, West Hinder and other Lightships.

The weekly crossings between Deal and Gravelines are considered too laborious not only for Belgium, who disposes of only one fishery cruiser, but even for any country assuming alone the regular completion of that work, besides other exploring operations occupying their ships.

A plan of international co-operation should be evised to meet the need of rapid information on the ariations of the physical and biological relations etween the Channel and the North Sea, in the nterest of all kinds of fishery work.

A discussion ensued on these two points; several chemes of work and lines of observation were proosed and discussed. It was decided to postpone the doption of a definite plan for both the occasional nd the continuous series of observations, until ne meeting of the following day.

The meeting adjourned at 4.30 p.m.

ctober 12th, 1932.

Professor G. Gilson in the chair.

The subcommittee met at 10 a.m.

After a discussion in which took part Dr. le Gall, r. Tesch, Dr. Hodgson, Mr. Lumby, Mr. Davis, r. Savage and the Chairman, the lines of hydroological work and the dates are fixed as follows:

1. Occasional work — to be carried out at the nd of October, if possible between the 25th of Octber and the 1st of November.

The following lines are adopted.

1. Orfordness to Wandelaar lightship.
2. Gravelines to Deal.
3. Margate to Ostend.
4. Folkestone to Boulogne.
5. Boulogne to Kentish Knock and Shipwash.
6. Boulogne to Gris Nez and Ostend.

Countries provisionally engaged to do the work:

1. Dr. Tesch, probably, will do the line 1 and the whole of the other work, except Boulogne — Ostend (reserved to Belgium). In case of impossibility, the English would do the same work.
2. Gravelines to Deal — Belgium.
3. Margate to Ostend — Dr. Tesch or English ship.
4. Folkestone to Boulogne — Dr. Tesch or the English ship.
5. Boulogne to Kentish Knock and Shipwash — Dr. Tesch or English ship.
6. Boulogne to Gris Nez and Ostend — Belgium.

2. Continuous work.

The line Deal — Gravelines should be done by Belgium, once a month. In the meanwhile, one of the other three countries, England, France and Holland, would do the same work.

Similarly, in case of impossibility for Belgium to carry out the work, it would be divided among the other countries, according to convenience.

N. B. Dr. le Gall will be prevented from doing any work before January.

The meeting was concluded at 12.30 p.m.

APPENDIX III.

Conférence d'Experts pour l'examen des méthodes scientifiques et echniques à appliquer à l'Etude des Poissons de la famille des Thonidés.

The meeting took place at Madrid and Cadiz om May the 16th to the 22nd 1932. The meeting as attended by Dr. Fernando de Buen, Spain, G. Belloc, France, and M. F. Frade, Portugal, signated by the International Council for the xploration of the Sea and Dr. Ed. le Danois, France, M. M. Sella, Italy, and M. H. Heldt, Tunis, designated by the Commission Internationale pour l'Exploration Scientifique de la Mer Méditerranée. The report of proceedings and the resolutions are published in the Rapport Atlantique 1931.

Reports of Area Committees.

NORTH-EASTERN AREA

1932.

By

Oscar Sund (Vice-Chairman).

The following work has been carried out by the countries represented on the Committee:

England (through the Ministry of Agriculture and Fisheries):

Measurements of cod were carried out at sea near Bear Island representing the catch of 23 different trawl hauls and measurements of all halibut caught on the same trip in August 1932. Shore measurements in Grimsby and Hull of cod, haddock, halibut and plaice from the Barents Sea. This material has been sent to Norway for utilisation in connection with the Norwegian measurements.

France. The Office Scientifique et Technique des Pêches Maritimes of France has supplied the following communication: "Le Commandant Beaugé, chargé de mission par l'Office Scientifique et Technique des Pêches Maritimes de France, a effectué, dans le courant de l'année 1932, une mission dans la région de la mer de Barents. Au cours de cette mission, diverses études ont été faites au point de vue de l'hydrologie et de la biologie appliquées à la pêche. Les résultats de l'étude du Commandant Beaugé seront relatés dans un prochain rapport du Comité de l'Atlantique Nord-Est."

Denmark. Material for racial studies on cod, haddock, saithe, herring and *Cottus scorpius* has been collected from fishermen along the coast of Northern Norway and will be investigated at the Carlsberg Laboratory.

Scotland. According to a communication from Dr. Alexander Bowman the "Explorer" carried out observations on the North-Eastern edge of the North Sea Plateau in the Region of the Viking Bank during the months of April and July. Herring larvae from 11 to 20 mm. in length were caught on the 16th and 17th April at four stations between the parallels of 60° and 61° N. No larvae were taken anywhere in July. 281 of the surface drift bottles liberated throughout the Northern North Sea at different dates in 1932 have been recovered from the coast of Norway. A total of 1060 bottles were liberated.

Norway. Besides the Directorate of Fisheries the following institutions have supplied information on their work in so far as it comes within the scope of the activities of the International Council, viz.: the "Geophysical Institute of the Bergens Museum", the "Tromsø Museum" and "Norges Svalbard- og Ishavsundersøkelser".

The Geophysical Institute has, by means of its research vessel, the m/s "Armauer Hansen", continued the investigations of the oceanography of the coastal and fjord waters of Western Norway, one trip every month except in February and September. In August moreover, a cruise was executed from the mouth of the Sogne fjord to North-East of the Faroes. The number of oceanographical stations worked in the course of 1932 was 170, the observations mainly affecting temperature, salinity and oxygen. In addition a number of comparative trials of different types of current meters was carried out.

Tromsø Museum. The programme of periodical (monthly) observations at a number of selected positions in the vicinity of Tromsø, started in 1930, was continued and in the course of 1932 some 800 observations of each of the following elements were carried out: temperature, salinity, oxygen, and, after leaving the samples untreated in three weeks: nitrate, phosphate, nitrite and p_H plus 76 determinations of ammonia as well as numerous plankton hauls. The museum possesses its own small research vessel, the "Sparre Schneider", for these periodical sea investigations.

The Government fishery supervision ship, H.M.S. "Fridthjof Nansen", was placed at the disposal of the Institution from May 22nd to June 25th for sounding work on the Bear Island Bank, the hydrographer of the Institute, lieutenant Rolf Kjær in charge. A total of 715 soundings, mostly by the Atlas

Echo gear, were taken. The results will be published in the form of charts, (nos. S. 2, S. 5 and S. 6) each of which will be kept up to date, as far as possible. A short account of the cruise is published in the "Polar Record", no. 5, Jan. 1933.

The Directorate of Fisheries ("Fiskeridirektoratet"). *Investigations at Sea.* Besides the research vessel owned by the Directorate the 80 ft. m/c "Johan Hjort" several other vessels had to be hired in order to have the work done. During the cruises carried out by means of the "Johan Hjort" the general hydrographical programme included: temperature, salinity, oxygen, p_H and phosphate in all depths of observation, besides plankton hauls with nets of 72 and 100 cm. diam. and silk no. 8 and 0 respectively, the former vertically from bottom to 300 m., 300 to 100 m. and 100 to 0 m., the latter for 5 min. surface hauls. The number of such observational stations in the course of the year was 534 out of which about 450 were worked according to the above "full" programme. Among other objects of the cruises were the catching of young fish with shore seines, the localisation of herring spawn by means of the Petersen-grab, the localisation of fish shoals by means of usual fishing gear, trawl, longlines, Danish seine, eel trawl etc. — The "Johan Hjort" was in commission from Jan. 31st to Nov. 9th and the following cruises were carried out by means of this and the other, hired, vessels:

Cruise	Dates	Vessel	In charge	Region	Nature of observations	No. of stt.
1	$^{1}/_{2}$—$^{20}/_{2}$	J. Hjort	Runnstrøm	W. Coast	Herring sp., Hydr.	367
2	$^{25}/_{2}$—$^{17}/_{3}$	A. Hansen	—	—	—	
3	$^{26}/_{2}$—$^{27}/_{4}$	J. Hjort	Sund	Bergen—Lofoten	Hydr., Plankton	203
4	$^{30}/_{4}$—$^{13}/_{5}$	—	Bjerkan	Bergen—Stavanger	—	32
5	$^{24}/_{5}$—$^{16}/_{7}$	—	Sund	Finmark—Barents Sea	—	156
6	$^{5}/_{7}$—$^{16}/_{7}$	A. Hansen	Bjerkan	W. Coast	do. and sprat fishery	27
7	$^{9}/_{8}$—$^{20}/_{8}$	Gunnerus	Runnstrøm	Trondheim fjord	Y. Fish & herr. fishery	—
8	$^{20}/_{8}$—$^{18}/_{9}$	J. Hjort	—	Bergen—W. Finmark	—	—
9	$^{20}/_{9}$—$^{9}/_{10}$	—	Bjerkan	W. Coast	Hydr. & sprat fishery	29
10	$^{21}/_{10}$—$^{8}/_{11}$	—	Eggvin	Bergen—Tromsö	Hydrology	47
11	$^{1}/_{12}$—$^{31}/_{12}$	Borgenes	Iversen	Barents Sea	Hydr. & Bottom fish	c. 70

(The „Gunnerus" is the research and live fish carrying vessel of the Trondheim Biological Station, a m/c of ft., the „A(rmauer) Hansen" is the research vessel of the Geoph. Institute, Bergen, a m/s of 78 ft. and the „Borge-s" is a privately owned Trawler from Kristianssund, 150).

The lastnamed cruise, that of the "Borgenes", Thor Iversen with Mr. Einar Koefoed in charge, has the main object of supplying material for the study of the biology of the food fishes, especially the sexual cycle of the cod and the whereabouts of the marketable sizes. The expedition is planned to work through the winter till the end of February.

Marking of Fish.

In 1932 four fish marking experiments were carried out, all concerned with plaice (*Pl. platessa*):

1) At Tananger, 17th—18th Feb. (west of Stavanger on the S.W.-Coast), 233 fish of which 76 or 33 % were recaptured.

2) In the Tana fjord and in the harbour of Berlevåg, E. Finmark, 14th—16th March, 245 fish, recaptured 75 or 31 %. In March to May (the spawning season) most of the recaptures were made by foreign trawlers outside the territorial limit.

3) At Kabelvåg, Lofoten, 19th March, in connection with aquarium experiments on the spawning rate etc. Liberated 41 fish, recaptured 19 or 48 %.

4) Vågsvåg, near cape Stat, 5th—6th Oct. Liberated 157 fish, recaptured 22 or 14 %.

Russian cod marking.

Of cod marked by the Russian authorities (the Oceanographical Institute or "Goin", Moskva) 18 were recaptured in the course of the year on Norwegian coastal grounds. Of these 5 were caught on the Finmark coast, four liberated very near the coast and the Norwegian border but one as far East as the Southern end of Novaya Semlya. Of the other 13 three were taken in Southern Norway. They were liberated near Spitsbergen and Bear Island. The remaining 10 were taken in the Lofoten area and came mostly from the Spitsbergen—Bear Island grounds (7) one from the Central Bank (76° N.—37° E.) and two from the Goose Bank (72° N.—48° E.). Though the dates of liberation have not been communicated, only the places, these records form a very interesting complement to the information given in the article by E. Mesjatseva in last year's Administrative Report on the recaptures in 1931.

Other Investigations.

Cod. During the coastal cod fisheries the work of collecting measurements of the fish caught by the fishermen was carried out on an extended scale, the total number of fish handled being 184,000 of which 69,000 in Finmark (April—June) and 115,000 spawning cod on the coasts South of Finmark. This was mainly the work of 4 measuring parties, each consisting of two men, working on the d'Arcy Thompson method which not only makes it possible

to accomplish an enormous amount of work when the fishing is plentiful, but also, on account of its prevention of bias, has brought out facts of an unsuspected character and highly interesting and important.

Otolith and scale material has been collected in connection with very careful determination of the sexual development of "skrei" as well as of Finmark fish. Mr. ROLLEFSEN who works on these questions is endeavouring to find in the otoliths signs of change in growth due to incipient sexual maturity in order to enable the determination of age at the first, and the number of subsequent, spawnings.

Racial studies. The number of vertebrae of the Norwegian cod is now well known thanks to the investigations of the late Prof. SCHMIDT and also through the Russian investigations which are in full accordance with SCHMIDT's results (53.6—53.8). The investigations of Mr. ROLLEFSEN on fry and quite young fish of which an important number of samples have been collected since 1930 all along the coast from Søndmøre to W. Finmark, throughout the entire spawning area of the Barents Sea cod, show, however, that these small fish have a much lower number of vertebrae, about the same as the fjord populations (52.00—52.80). Fry with the same vertebral number as the skrei has so far not been found in the shore region of the Norwegian coast, while a collection of 3-year old fish from the Barents Sea show figures near those of the skrei. This material has been supplied by the experimental trawlings during the cruise of the "Borgenes" in December 1932, referred to above.

Herring. The biostatistical investigation of the herring stock has been continued by Dr. RUNNSTRØM. The number of samples amount to 67, 27 of which are of immature herrings. The total number of individuals treated was about 10,000.

Age-determination has been made on the entire material and growth zone measurement on a considerable portion of it while counting of vertebrae has been performed on an extensive material. A short account by Dr. RUNNSTRØM of the results of this investigation has been sent to the Journal of the Council (Vol. VIII, 2).

Experiments with artificial fertilisation of herring spawn and with hatching at different temperatures have been carried out at the Bergen Museum Biological Station at Herdla, by Dr. RUNNSTRØM.

Sprat. Under the direction of Mr. BJERKAN samples of commercial catches have been collected along the whole "brisling coast" from the Swedish border to Romsdalen (beyond Cape Stat) and these samples show that the catches mainly consisted of one-year old fish.

During the cruises in the West coast area, during the brisling season (referred to above as cruises no. 6 and 9), the following points were considered: occu rence of sprat in connection with surface temperatur the influence of the quantity of zooplankton on th quality of the fish and the admixture of small he rings, besides general hydrological and plankton ob servations.

Haddock. During the summer fishing in Finmar a considerable number of haddock was measured.

Germany. In addition to the usual observation on commercial catches in the Wesermünde market o fish from the Barents Sea, by Dr. JOHANNES LUNI BECK, investigations have been made at sea durin two voyages of German trawlers enabling also th small fish to be observed. Both voyages were mad in October, one to the Kanin the other to the Bea Island region, thus providing material for compariso between these two important areas.

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NORTH-WESTERN AREA

1932.

Compiled by Dr. Å. V. TÅNING, after the death of Prof. JOHS. SCHMIDT.

he following work has been carried out by the various countries.

England.

o work has been done in the North Western a during 1932.

France.

n 1932 l'Office Scientifique des Pêches Maritimes collected material from the Greenland fishing ks and a note on this is given by Commandant UGÉ in appendix A (page 18).

Germany.

ydrographical and plankton investigations have n undertaken in Icelandic waters.
he patrolship "Weser" made a cruise from August to September 5th 1932 in Icelandic coastal waters. KURT KALLE took part in this cruise in order to ct the usual hydrographical material and to stigate the food-stuff in the fishing districts off nd in conjunction with simultaneous plankton-stigations made by Professor E. HENTSCHEL[1]) the Zoologischen Staats Institut, Hamburg. gentlemen were appointed by the Deutschen enschaftlichen Kommission für Meeresforschung. number of hydrographical stations during the e to Iceland and back as well as a single voyage d the island was 94. The investigations included erature and salinity determinations as well as rmination of phosphate contents by means of Zeiss' Pulfrich-Photometer. For the first time, ermore the total phosphate content deter-tions were tried in practice during a researeh e. It turned out that, owing to the conditions urrent and the influence of the coast in the rsed districts, the changes in the water com-ion in most cases were clearly reflected in the hydrographic factors investigated. The depen-between the results of the plankton research he hydrographic values was not generally, de-ly definable although several cases of clear lism were established particularly by com-g the amount of plankton with the total content osphates in the water samples. The results of observations by Dr. KALLE and Professor SCHEL are in print and will appear in "Be-n der Deutch. Wiss. Komm. f. Meeresforsch.".

Summary of results of observations (By Prof. Dr. E. HENTSCHEL)[1]).

1. The work contains quantitative research of Nanno- and Microplankton on the coast of Iceland from a cruise round the island in August 1932 and several shorter cruises.
2. The composition of the plankton is determined in a specially clear way by both essentially different kinds of water, that wash the Icelandic coasts, viz. the Atlantic water in south and west and the Arctic water in north and east.
3. Both currents produce, on the coast, a strong growth of characteristic species of Diatoms; the Atlantic current is furthermore well defined by the presence of coccolithophorids.
4. The biological borderline between the two kinds of water is particularly sharp in south-east while in north a more gradual change takes place; both in respect of hydrographical conditions.
5. Neritical qualities of the plankton are assignable in respect of both neritic and oceanic species.
6. Of neritic factors the following seems to be of influence: coast-line, current, formations of eddies, freshwater-supplies, ascent of deep-water.
7. In spite of considerable differences in plankton according to season and to years the regular occurrences outweigh the occasional fluctuations.
8. The metazo-microplankton is usually not in accordance with the nanno-plankton in their maxima and minima; the most important investigations seem to confirm that simultaneous chief maxima preclude each other.

Norway.

Throughout the year 1932 the mail steamer "Nova" plying monthly between Bergen and Faskrudsfjord (E.-Iceland) and along the North Coast to Reykjavik and back via the Faroes, was fitted with a sea thermograph and regular records have been obtained. The mode of publishing the results has not yet been decided upon. From the beginning of 1933 the other Norwegian mail steamer in the Iceland service, the "Lyra", which runs every fortnight between Bergen and Reykjavik via Faroes returning by the same route, is also fitted with a similar instrument and once each quarter a series of surface water samples will be collected, each series comprising 35 samples, some of them from predesigned positions, but mostly at equal intervals.

[1]) See Plankton Committee report, p. 68.

In August a number of oceanographic observations were carried out in the East Greenland waters by Capt. THOR IVERSEN of the Norwegian Fisheries Directorate. He joined a sealer, the "Polaris", and the oceanographical stations were taken in the course of that vessel's regular voyage. The observations comprise salt and temperature only, the latter being in each case (except at the surface) obtained by the use of two reversing thermometers. The observations comprise 8 stations, two of them being in fjord depths of over 700 meters, in all 82 observations of temperature and the corresponding salinity. The 7 first stations are in S.E.-Greenland in lat. 60° to 63°, the last in lat. 68°.

Scotland.

No work has been done in the North Western Area during 1932.

Denmark.

R/S "Dana" carried out a cruise to the Faroes and Iceland during the months of June to August. Having worked in the North Sea the "Dana" commenced researches in the Faroe-Shetland Channel on the 10th of June; the work at the Faroes lasted from the 13th of June to the 23th of June and was continued from the 31st of July to the 7th of August; in the interval — June 24th to July 30th — work was carried out south of Iceland, off Iceland, in the Denmark Straits and along the East-Greenland coast.

Iceland and Denmark Straits. As in the previous year the drift of the pelagic cod fry from Iceland across the Denmark Straits to East-Greenland was examined. The research was carried out in the month of July (from 8th to 15th July) as in 1931 and showed, like that year, an abundant drift of cod fry with the west-going branch of the Irminger current towards East-Greenland. Drift of cod fry with the east-going branch of the current along North-Iceland was proved as usual (late in July). Simultaneously with these researches ordinary drift-bottles were liberated in the Denmark Straits as well as to the north of Iceland. The distribution of fry of halibut and Greenland halibut in the Denmark Straits was examined at the same time as also that of other species such as haddock, green-cod, etc.

As in previous years trawlings were carried out within and outside the territorial limit in Faxe Bay; work being done 28 hours at each place. On the territory these trawlings showed a smaller number for instance of plaice than in previous years and the number per trawling hour on the territory was only a little higher than outside the territory this year (20 to 15). At the same time 150 plaice intraterritorially and 150 extraterritorially were marked. Territorial trawlings were also carried out on the South and the East coast; the year class 1928 of plaice were found to be best represented.

At a number of places along the coastlines of Iceland the amount of the groups 0—II of cod, haddock green-cod and plaice was examined, with e.g. ee hand seine, and material for age composition of th stock has been gathered everywhere.

South of Iceland pelagic researches were undertake over great depths; here still un-metamorphosed eel larvæ were found on 62°23′ N. 16°05′ W.

Marking of cod was undertaken in March an April on the South coast (the Vestmanna-Islands 1163 specimens of spawning cod) and at the Nort coast outside Siglufjord (about 100 codlings); th work was carried out with assistance of the Icelandi inspection-ship "Thor", and others.

Collecting of material for the determination o the age composition of the stock of cod has bee done since 1931 by the "Fiskifélag Islands" and th material has been worked out by ÁRNÍ FRIÐRIKSSON M. A. who conducts these researches.

The material with regard to plaice marking don at Iceland in 1924 and following years has bee treated (by Dr. TÅNING) and the results from som of the experiments are ready for publication.

Greenland. Apart from the above-mentioned re searches on the drift of pelagic cod fry along th coast of East-Greenland cod marking experiment have been continued at Greenland. These marking have been done with assistance of the Greenlan Directorate, the Danish inspection ship "Maagen and the Faroecutter "Suderøy". The marking comprise 1061 cod at West-Greenland and 277 co at East-Greenland (Angmagssalik).

Until December 31st 1932 a total of 89 cod marke at Greenland since 1924 has been reported and re captured at Iceland; further 12 cod marked at Ic land have been recaptured at Greenland during th last few years.

During 1932 various expeditions to East-Greer land have carried out researches at sea as well a in coastal waters: Dr. KNUD RASMUSSEN'S exped tion to S.E.-Greenland, Captain EINAR MIKKELSEN expedition to the Blosseville coast and Dr. LAUG KOCH'S expedition to the Scoresbysund — Fra Josephfjord district.

Hydrographical data were collected during D KNUD RASMUSSEN'S expedition and trial hauls we made in the southern fjords of the east-coast (b Mr. PAUL HANSEN, M. A.).

During the expedition by Captain EINAR MI KELSEN from Iceland to and along the Blossevil Coast soundings, hydrographical, plancton and bo tom investigations were carried out at abt. 50 statio (Mr. M. DEGERBØL, M. A.).

As a link in Dr. LAUGE KOCH'S 3-years investigatio at the East Greenland plankton samples were r gularly collected and hydrographic observatio made during the winter 1931—32 at the Ella-isla in the Franz Josephfjord and furthermore the bo tom-fauna of the fjord was investigated, for instan quantitative research with bottom samplers (b Mr. G. THORSEN, Mag. sc.). During the summer 19

S/S "Godthaab" was furnished for hydrographical marine biological investigations with Dr. R. RCK in attendance. The work with echo sound-s, commenced in 1932, was continued and thus entire delta of Franz Josephfjord, the Godthaab f and parts of the coast shelf is now known in ject of depths although but in rough lines. Within same districts the following investigations were ried out: hydrographical observations, hauls with ring trawl and Hensen-net, hauls with the Sigsbee-wl and dredge as well as bottom-sampler investiga-is at a total of 138 stations. The results will be lished in Medd. om Grønland Vol. 100.

aeroes. This year, as in previous years, material he younger year-classes of cod, green-cod, plaice has been collected everywhere in the Fjords. Some wlings have been done especially for collecting erial of haddock. A material for maturity — and al — investigation of herring has been collected. n Trangisvaag-Fiord an insignificant amount of t fry was found as in the previous years.

t the Faroes a continuous collecting of material investigation of fluctuations in the stock of cod now been undertaken through the government. material is collected through the fish controllers n 5 different places. As an experiment 800 samples toliths together with 3000 measurements of cod collected in the autumn of 1932.

arking of spawning cod has been done North of es where 226 specimens were marked in April— A paper on cod-marking experiments in Faroese rs by A. STRUBBERG is ready for press.

ydrographical stations and collecting of Plankton further been done with "Dana" in continuation hose from previous years.

uring June, in the Faroe-Shetland Channel, na" has investigated a hydrographical section the pelagic fishery has been carried out as usual nvestigation of the eel larvæ; on June 11th as as on August 8th a few eel larvæ were found ne Channel.

hales. The collection of statistics has been nued at Greenland and the Faroes.

cial Investigations. Collection and treatment ne species (*Gadus morrhua, G. aeglefinus, G. vi-Cottus scorpius*) mentioned at the last meeting been continued and investigations with regard me other species have been commenced.

her Investigations. Experiments have been rtaken to investigate the degree of mutual ness attained by various persons who, inde-ent of each other, have analysed a material of ths of cod more than 5 years old. Investigations ontinued based on the results gained from the ment of samples from Iceland.

e material of eel larvæ from "Atlantis" sent by BIGELOW has been treated.

nkton Investigations (Prof. OVE PAULSEN).

nkton has been collected (by E. NIELSEN, M.A.) hydrographical stations round Iceland and on the cruise from Iceland to Greenland and back partly by vertical hauls with a fine Nansen-net and partly by preservation of water samples from 0, 10, 25 and 50 m. depths. This work concerns a total of 70 stations during the period: end of June to end of July.

Although counting of quantitative samples has not, by a long way, been completed it is possible to give a short review on the plankton distribution.

While the plankton at oceanic stations south of Iceland mainly consists of Coccolithophorids the plankton on the south- and southwest coast of Iceland consists mainly of Diatoms in addition to naked Flaggelates. The following must be specially mentioned:— *Chaetoceros cinctus, Asterionella japonica, Leptocylindrus minima* and *Nitzschia delicatissima.* Each of these species are generally found in numbers of 100—1000 per cm.^{3}.

At the northwestern Icelandic corner, also, a rich plankton population was found mainly consisting of naked Flagellates and Diatoms, especially Chaetoceros species (*C. debilis* up to 350 per cm.^{3}).

Plankton on the North and East coast, on the other hand, was very poor. South of 64° N., again, a comparatively abundant plankton was met with (Diatoms).

Samples from the Denmarks Straits have not yet been counted, but the net samples shew that Diatoms are dominating. Samples from some of the stations along the ice-border near the coast of Greenland have been counted. All of them seem to confirm the presence of a comparatively rich plankton population. In addition to the Flagellate *Phaeocystis Pouchetii*, found in numbers of 1500 cells per cm.^{3}, numerous Diatoms were present, particularly Thalassiosira species, Chaetoceros species, *Fragillaria oceanica* and *Nitzschia delicatissima*, often found in numbers up to 100 per cm.^{3}.

The results of the quantitative plankton investigation in the Denmark Straits have been made the object of a paper in preparation by Professor OVE PAULSEN and Mr. E. NIELSEN, M. A. (See further p. 64).

Hydrography (Professor MARTIN KNUDSEN). During the cruise of the R. S. "Dana" in the northern Atlantic from June 10th to August 8th hydrographic investigations were carried out at 119 stations in the Faeroe-Shetland Channel, the waters round the Faeroes and Iceland and in the Denmark Straits (by Mr. H. THOMSEN, M. A.). At all these stations determinations of temperature and salinity were made, and at a great part of the stations determinations of the contents of oxygen, phosphate and nitrate also. The material collected will be published in the Bulletin Hydrographique.

Of particular interest are the phosphate and nitrate investigations. These proved, that the waters on the Faeroe shelf outside the fjords contained great amounts of phosphate (30 to 45 mg P_2O_5/m.^{3}) and nitrate (75 to 125 mg. N_{NO_3}/m.^{3}), the contents being constant from the surface to the bottom (ca.

100 m.). This is due to the intensive mixing of the waters which pass the shelf.

The investigations of phosphate and nitrate in the Denmark Straits confirmed the results found by the German Meteor Expeditions in 1929 and 1930. In the cold water of the East Greenland current no, or very small amounts of, phosphate and nitrate were found at the surface; the surface-water of the warm Irminger current proved to be richer in phosphate and nitrate, but in the mixing area between the two currents mentioned the greatest phosphate and nitrate contents were found amounting to 50 mg. P_2O_5/m.^{3} and 100 mg. N_{NO_3}/m.^{3} respectively.

The coastal waters of Iceland were generally found to be poor in phosphate and nitrate at the surface.

In addition to the above mentioned investigations hydrographic observations have been carried out from the inspection ships "Fylla", "Hvidbjørnen" and "Islands Falk", and from liners to Iceland and Greenland.

The scientific Report of the North-Western Area Committee for 1930—1932 will not appear until the autumn 1933 owing to the death of Professor Schmidt.

Appendix A.

Note

au sujet des recherches effectuées par la France sur les Bancs de Terre-Neuve et du Groënland au cours de l'année 1932.

Par le Commandant L. Beaugé.

Le délégué de l'Office Scientifique des Pêches Maritimes ayant été envoyé à l'Ile aux Ours et en Mer de Barentz pendant la campagne 1932, les sources de la documentation française sur les côtes américaines sont les suivantes:

1) Rapport du stationnaire Ville d'Ys. L'enseigne de vaisseau Pelletier a exécuté, conformément aux instructions de l'Office un certain nombre de prises d'eau et de températures. Grâce au soin apporté à l'exécution du travail, notamment dans la coupe effectuée entre Terre-Neuve et le Groënland, nous avons pu relier une fois de plus ces deux champs d'action et nous rendre compte des variations hydrologiques dans la région.

2) Rapport de Monsieur le capitaine de corvette en retraite Guyader, commandant le Navire-Hôpital Ste Jeanne d'Arc, de la Société des Oeuvres de Mer. Nous avons obtenu, par cette voie, un certain nombre de données qui nous ont permis d'établir, concurremment avec les renseignements de la Ville d'Ys, les courbes de température à 50 mètres et au fond, pendant le mois de juin, sur le Grand Banc. Le dernier rapport nous donne sur la pêche au Groënland, l'état du temps, un bon nombre d'observations intéressantes.

3) Communications faites par un certain nombre de capitaines, concernant la situation hydrologique des régions pêchées et la pêche. Cette documentation complète en plusieurs points la précédente et nous permet de suivre la modification hydrologique générale du Groënland jusqu'au mois de Novembre.

Cet ensemble de renseignements a été réuni par les soins du délégué à Terre-Neuve et rassemblé en un rapport qui doit paraître prochainement à la Revue des Travaux de l'Office des Pêches.

Conclusions de ce rapport:

Des renseignements que nous avons pu analyser, il résulte que la situation à Terre-Neuve et au Groënland s'avère comme rigoureusement conforme à ce qu'il avait été annoncé comme pronostics de campagne: à savoir que le Groënland a été beaucoup moins avantageux pour les pêcheurs que les dernières années. On peut estimer d'une façon générale que depuis 1929, la situation du Groënland n'a pas cessé d'être de moins en moins satisfaisante et nous imaginons, bien que n'ayant à cet égard que les indications des Islandais de Paimpol, lesquels fréquentent le Groënland depuis 1926, que la meilleure année de la dernière décade a été 1928.

En tout cas, cette année, les eaux froides ont subi un retard très marqué dans leur progression. En mai il n'y avait pas d'icebergs en vue du Cap Farewel jusqu'à 60 milles au large et ce n'est qu'en juillet qu'on les signale par 61° de latitude Nord. Il en est résulté que l'apport d'eau polaire qui marque, par son avance sur les bancs du Sud du Groënland, la montée de la morue vers le Nord, n'a pas eu lieu à la date ordinaire. La pêche fut désastreuse jusqu'à la fin de juillet, contrariée en plus par le mauvais temps et ne donna vraiment de bons résultats, comparables aux fortes prises des années antérieures que très tard dans la saison, autour du 15 Octobre; il s'agissait à ce moment d'un rassemblement du poisson, sortant très vraisemblablement des fjords et se reportant vers le sud. Les bancs du Fylla et Fiskernaess qui avaient été désertés pendant l'été se trouvaient, à cette époque tardive, couverts de poisson, comme l'année précédente, à cette même époque, se trouvait le banc du Helder. Par contre les bancs d'extrême Nord, comme le Store Hellefiske ont été beaucoup moins favorable que les années précédentes et pendant un très court laps de temps. Pendant toute la période de juin et juillet, le poisson semble rester dans les fonds supérieurs à cent mètres, en dehors des bancs. Ce n'est qu'en Août et Septembre, par bandes très passagères que les morues ont traversé

bancs du large, se rendant vers les fjords. Du 10 20 Octobre, à la suite d'un fort coup de vent de l-Ouest, se produisirent de grands rassemblements, oitement localisés, à la suite desquels la morue paraissait complètement, pour se retrouver, comme l'a constaté, beaucoup plus au sud, à 200 ou 250 lles plus sud.

Pendant ce temps, à Terre-Neuve, la campagne sur Bancs fut excellente pour les navires qui y re-rent. Les conditions hydrologiques étaient ex-lentes et classiques, c'est-à-dire favorables sur les ncs de l'Ouest (Ile des Sables en particulier) au printemps; bonnes sur le Banc de St. Pierre jusqu'en fin juillet, bonnes au Grand Banc sur les accores du Sud en juin et sur les accores de l'Ouest en Août. Somme toute, il suffisait de tâter les fonds pour trouver une excellente pêche sur un point ou sur un autre.

Cette situation est la continuation de l'amélioration déjà signalée l'année dernière et tout fait prévoir, pour 1933, une pêche très satisfaisante à Terre-Neuve. Tout au contraire, le Groënland sera peu avantageux, sauf pendant une courte période.

PLATEAU CONTINENTAL ATLANTIQUE

1932.

(Atlantic Slope).

Par

Ed. le Danois.

es croisières effectuées par les soins des Gouverne-ments d'Espagne, de France, de Grande-Bretagne, lande et de Portugal, se répartissent de la façon rante:

pagne: Sorties du navire "Xauen", en Février, Mai, Juin, Juillet-Août, Septembre et Novembre.

nce: Sorties des navires "Estafette" et "Sentinelle" de la Marine Nationale en Avril-Mai, Juillet-Août.
Croisières du Navire "Pourquoi-Pas?" en Août et Septembre.

nde-Bretagne: Sorties mensuelles du S. S. "Salpa".

nde: Sorties du navire "Muirchu" en Février, Mai, Août et Novembre.

tugal: Croisières du navire "Albacora" en Mai et de Juin à Septembre.

n plus des croisières, le Comité du Plateau Con-ntal Atlantique a manifesté son activité par une réunion tenue à Madrid et à Cadiz sur l'invitation du Gouvernement Espagnol en vue d'arriver à la détermination des méthodes à appliquer à l'étude des poissons de la famille des thonnidés. Ces réunions spéciales comprenaient les Experts désignés par le Conseil International, à savoir: MM. Fernando de Buen (Espagne), G. Bellog (France), F. Frade (Portugal).

Mais, en outre, par suite de l'importance de la question, la Commission Internationale de la Méditerranée avait tenu à prendre part à cette Conférence scientifique: M. M. Sella (Italie) et H. Heldt (Tunisie) participèrent aux délibérations.

J'eus l'honneur de présider les 9 séances de cette Assemblée à la fois comme Président du Comité du Plateau Continental Atlantique et comme Secrétaire Général de la Commission Internationale de la Méditerranée.

Le compte-rendu et les décisions ont été publiés pour éviter tout retard dans le Rapport Atlantique de 1931.

1932	Grande-Bretagne	Irlande	France	Espagne	Portugal
Janvier	Salpa	....	....	....	....
Février	....	Muirchu	....	Xaùen	....
Mars	Salpa	....	....	....	....
Avril	Salpa	....	Estafette	....	....
Mai	Salpa	Muirchu	Estafette	Xaùen	Albacora
Juin	Salpa	....	....	Xaùen	Albacora
Juillet	Salpa George Bligh	....	Sentinelle	Xaùen	Albacora
Août	Salpa George Bligh	Muirchu	Sentinelle	Xaùen	Albacora
Septembre	Salpa	....	....	Xaùen	....
Octobre	Salpa	....	....	....	....
Novembre	Salpa	Muirchu	....	Xaùen	....
Décembre	Salpa	....	....	....	....

COMBINED NORTH SEA AND EASTERN CHANNEL COMMITTEE

1932.

By

G. Gilson.

It has been agreed in previous meetings that the mission of combined committees should be to ascertain existing inter-relations between adjacent seas and to promote working association between biologists and hydrographers engaged in the study of neighbouring regions.

However, it was admitted also that a distinct knowledge of an intermediate area is needed before schemes for co-operative research, free from prevention or bias, can be practically devised. A certain amount of facts must be collected and tabulated before the normal play and the fluctuations of physical and biological phenomena can be pointed out and th causes looked for on both sides of the transitional zo

The region between Channel and North Sea undoubtedly, one of the most interesting transitio zones in the world. It has been the field of very act hydrographical and biological investigation, c densed in a great number of memoirs showing extreme variability and intricacy of phenomena tak place in the meeting zone of contrary tidal seas s mitted to violent meteorological action.

In accordance with these remarks it has been p posed that whilst the neighbouring countries wo

y on their usual Investigations, an attempt should made to organise a day of simultaneous obser- ons along certain lines in the neighbouring areas.

Current Work in the Neighbouring Areas.

rance. The laboratory of the "Office Scientifique echnique des Pêches Maritimes" at Boulogne has ied on researches on the existing relations between two neighbouring herring populations: Channel ing and southern North Sea herring — with the ial view to determine the meeting region of these "types" discernible by their mean number of ebrae. Particular attention was also paid to the composition and rate of growth of the shoals. ilar observations have been made at the same on board the fishing vessels and on the lightship ndettie".

everal memoirs on the results of the work are in aration.

ngland. Herring work in East Anglian waters Flemish Bight — in close connection with the y of the Southern North Sea variety and its dering southwards and eventual penetration into Channel. Researches on young herring and sprat. inuous hydrographical and plankton observations on research vessels and especially on the Varne ship with Carruthers' current registering ap- tus. Active marking of fishes carried out for the y of the rate of growth. Otolith work. See more led accounts in Report of the Southern North Committee.

ermany. Connected with extensive work carried in the German Bight a considerable amount of concerning the study of biological conditions e transitional zones has been collected by the eidon", the "Augusta" and the "Weser" in the ernmost part of their cruises. An important oir on the shrimping industry and coastal fishery he German coast, recently published[1]) contains of great interest for the study of the destruction ung fish on the neighbouring coasts of Holland, um and France, in the South, and of Jutland e north of the Bight. A review of this memoir e printed in the August number of the Journal onseil.

lland. Continuation of scalimetric research on ng from various fishing grounds, among which Southern region. Age composition of shoals. arch on coastal fishing and destruction of young onectids, in continuance of the work previously d out by Dr. Tesch by order of the Dutch rnment.

Report of the Chairman of the Southern North Committee.

lgium. Work limited to the transitional zones. rches initiated years ago continued with great lity since the loss of the research ship "Oithona".

[1]) A. Wulff and A. Bückmann. Der Gammelfang der Seefischer. Nach Untersuchungen von A. Schubert. Wiss. Meeresunters. XIX. B. 1. 1932.

Recently the old steamtrawler "Victoria", obtained for the Service Hydrographique de la Marine in the summer, became available for biological exploration during the winter months, — too late for Herring and Sprat Research this year. A small decked motor boat suitable for shore work will be used in the summer.

Herring. A special study has been made since 1930—31 on the remarkable concentration of herrings every winter, from December till March, along the French and Belgian coast, supplying a rich material of nearly pure spents to a quite particular fishery exercised almost exclusively by small motor craft using either the trawl or the stroopnet.

It is intended to continue the study of this annual concentration during several years, the stage of spent being considered a convenient starting point for methodically tackling the general problem of the life history of the herring. Samples of 30 herrings were levied every fishing day of the season on the catch of one boat and minutely analysed. Special attention was paid to the number of vertebrae, age composition from the scales and otoliths, and variations of the content of the stomach, in view to the identification of variety and origin, and for the drawing of previsions as to relative abundance of each class for the following year.

The total weight of this season's catch was 2,673,185 kg.

The total auction value of the catch was 2,446,867 frcs.

The number of herrings caught was approximately 29,324,839 individuals. Two memoirs in preparation are soon to be printed.

Sprat. Continuation of serial work started in 1928: analyses of daily samples of 1 kg. during the entire season. Scales, vertebrae and notation of the percentage of young herring in each daily catch of sprat. Material accumulated for pushing forward research on first appearance, displacements of shoals and final disappearance — when the necessary research ship will be available.

Total weight of the catch in 1932—33 = 5,090,845 kg.

Total value of the catch in 1932—33 = 1,250,271 Frcs.

Total number of sprats caught in 1932—33 = 457,666,966 individuals.

Shrimps. Material collected for the study of fluctuations in fishery and in composition of stocks. Percentage of egg-bearing females and abundance of larvae. A motor ship wanted for work near the shore.

Young fishes in coastal stage. Continuous research, after the removal of the research steamer "Oithona", carried on with cutters fishing in well determined positions. Data concerning the growth rate of the plaice collected, interruptedly.

Destruction of young-fish. Material of above research made use of for estimation of importance of destruction both of market fish and of non commercial species. Inquiry ordered by the Belgian

Government. Complete analysis of catches. Sorting of all vertebrates and invertebrates. Measurements of all individual fishes. Tabulation, calculation of percentages, drawing of diagrams. Preliminary memoir published on results in May 1932. Dab predominating and enormously more abundant than plaice. Whiting very variable but by no means unimportant: up to 15 thousands in one haul. General report to be printed soon after the completion of one year's work.

Total weight of material treated up to March 15th about 5,000 kg.

Number of individuals destroyed by one motor cutter for the 7 principal commercial species:

Skate	1,125
Sappherine Gurnard	1,889
Whiting	26,020
Plaice	4,295
Flounder	738
Dab	37,536
Sole	2,179
Total number of young-fish of the 7 species, destroyed from May 1932 to March 1933 by one motor cutter	73,782

Proposal for transplantation of very young fish from the shore to outside the line of 20 or 25 metres, for the benefit of coastal and high sea fishery. Preliminary marking experiments needed. Special technique for transplantation of live fish.

Food of fishes. Research started on the importance of very young fishes as food for bigger fishes. Constant examination of stomachs of spent herrings: no food just after arrival in the littoral zone. Later on, abundance of copepods, young *Temora longicornis* strikingly prevalent, almost exclusive.

Hydrographical work. Daily observations of air and surface water temperature on light-ship West-Hinder. Weekly samples of vertical plankton hauls and surface water for salinity.

Scheme of weekly crossings of the Straits between Deal and Gravelines with 4 hydrographical and plankton stations especially for fish eggs and larvae. Interruptions, — the Marine not being able to dispose continuously of the only fishery cruiser "Zinnia".

A lot of 100 *Cottus scorpius* was sent to the late Professor Johs. Schmidt at Copenhagen for racial study.

II. Simultaneous Work in the Area.

A meeting of workers specially engaged in the study of herring problems in the transitional zone between Channel and North Sea took place at Lowestoft on October 11th, 1932, — see the Proceedings of the meeting, this volume, Part I, p. 10.

It was decided that an attempt at simultaneous co-operation should be made this year, considering that difficulties in the way of organising a first trial were to be expected from various causes and time being very short, all that could be hoped for was to be quite ready for work in time for next year's season.

The time of the simultaneous cruises was fixe for the last days of October or the first of Novembe notwithstanding the unfavourable fact that the ve important participation of the Boulogne laborato could not be obtained, the French research ship beir laid up for repairs until the first days of January, ar M. Le Gall being sent abroad on a scientific missio

It has been found since, however, that the carryi out of a scheme of simultaneous work is a mo trying task than had been anticipated. The princip hindrance appeared to lie in the fact, that at th time of year all marine laboratories are engaged urgent work and that neither ships nor assistant biologists or hydrographers, are free to cut short the work for the carrying out of special operations sea, and, after completion of the cruises, for immedia analysis, tabulation and charting of the material co lected, in order to supply data for fishery work follow as quickly as possible. The starting of the wo had to be delayed until the beginning of Novembe which was very late.

In fact the "Onaway", the "Nautilus" and t "Zinnia" did each their affixed lines regularly enou in the space of 3 days. As to the fishing part of t scheme that was to follow, it could not be devis before the data for temperature, salinity and plankt had been centralised and displayed on charts. U foreseen difficulties were encountered: for instan the service of water analysis at Ostend was temp rarily dis-organised, and it appears that none of t laboratories was in a position to work out the plankt samples rapidly. Scarcely any of the fishery resear ships were available to do work at short notice, ar the fishing gear of the "Zinnia", never very suitab for herring work, was out of order.

Undoubtedly the hydrographic and biological o servations made by the simultaneous cruises of t expedition will supply, when worked out, interesti data for the general study of the transitional zone, b the difficulty of obtaining rapidly the bulk of t results could not be overcome on this first trial. was thus impossible rationally to draw up a programm of a rapid fishing survey tending not only to t advancement of knowledge but also to supply pra tical information to the fishing of the same seas in the area.

The necessity of simplifying the work made its strongly felt and it is our intention to apply to t Plankton and Hydrographic Committees to obta both advice and co-operation for the setting up a scheme for obtaining satisfactory information the shortest possible time. May I be allowed to a that it is on such occasions that the existence of plankton as well as a hydrographical internation laboratory appears really desirable.

It is also to be hoped that countries interested southern problems although not in direct touch wi the region, — e. g. Germany and Denmark — m also take part in the co-operative survey of t transitional zone.

NORTHERN NORTH SEA
1932.

By

Alexander Bowman.

view of the limited resources at the disposal of he Committee for the investigation of the many blems of this large region the policy of concen- ing the more detailed biological researches on the ring and haddock, the two most important com- cial species within the area, has been continued. While the yield of the commercial fisheries was rtained by the routine collection of monthly istical data of the quantities and values of the rent species landed, the special trawling experi- ts were directed mainly to an age-assessment of haddock shoals. In the conduct of the herring stigations the recommendations drawn up by the ring Experts at their meeting at Lowestoft in ember 1930 were adhered to, as far as possible, the analysis of the complex herring shoals and particularly for those of the north-west area. re is thus being built up very definite knowledge rding the changes which are taking place in the position of the stocks of these two very important ts over a series of years.

he following are résumés of the work which has carried out in the area during the year by the ous countries concerned.

Denmark.

her way to and from the Faroes the Danish arch Vessel "Dana" was able to carry out some rvations in the area. In the beginning of June ling, plankton and hydrographic observations made off the Scottish East Coast while in the le of August three trawling stations north of the t Fisher Bank were examined. The hydrographic rvations include nitrate and phosphate deter- tions; they indicate a larger content of these ent salts in the Northern than in the Southern h Sea.

e majority of the haddock caught off the Scottish Coast in June were not older than year class while in the eastern part in the middle of st haddock of all ages were very sparingly sented.

all samples of *Cottus scorpius* collected at diffe- times on the Scottish East Coast were sent to nark for racial investigations. Two samples of haddocks of the 1931 year class from the north otland and from the middle North Sea were also for racial investigation.

Å. Vedel Tåning.

England.

As in former years, the abundance and distribution of the demersal marketable species caught in the North Sea as ascertained from the combined English and Scottish data of the monthly landings from each unit statistical area have been tabulated by the Ministry of Fisheries (England).

Ichthyometrical data concerning 1455 plaice, 75,545 haddock and 12,467 cod collected at sea on commercial vessels in the northern area throughout the year have also been compiled by the Ministry of Fisheries (England). The haddock measurements have been handed over to Scotland for analysis.

F. M. Davis.

France.

In continuation of the work of previous years France investigated conditions on the Fladen and Utsire herring and mackerel fishing grounds, observations being made from the Fishery Service Vessels. Supplementary data were obtained by an observer, E. P. Priol, who made two trips on trawlers — one in April on the "Asie" (Skipper, J. Malfoy) from Boulogne to Utsire and the other in August on the "Capitaine Armand" (Skipper Battel) to the Fladen Ground. During August the Cruiser "Quentin Roosevelt", commanded by Capt. Husson, worked along the line Bergen to Peterhead, the observations being made by Ensign Bernard. The Fladen Ground was also visited in August by the Cruiser "Sentinelle" commanded by Lt. Daynac. The observer on this occasion was Professor J. J. le Gall who also conducted a survey of the drift-net fishery areas from the Cruiser "Estafette" commanded by Lt. Thebaut.

On all voyages water samples were taken and temperature and salinity data secured. Mr. E. P. Priol, on his trips on the commercial vessels made numerous measurements of herring, mackerel, hake and saithe and in addition to the examination of the hydrological conditions he also studied the invertebrate fauna of the grounds trawled. The results of the continuous study of the Fladen herring carried out at the Boulogne Station will form the subject of a communication at the next meeting of the Council.

Jean le Gall.

Germany.

The work done in the Northern North Sea during 1932 was carried out from the Hamburg Laboratory of the Deutsche Wissenschaftliche Kommission für Meeresforschung.

Dr. LISSNER published an article in the "Fischerbote" (1932, p. 77) on the trawl herring fishery in 1931, the yield of which amounted to 75.5 millions kg.

All over the North Sea the predominance of the four year old herring originating from the year 1927 was apparent. It was possible however — as confirmed also by racial investigations — to distinguish a larger form of about 27 cm. in length in the north which did not occur in the south. These larger fish were spring spawners which had immigrated from the west and as a consequence of their unexpectedly great numbers the prediction for the year 1931 did not prove correct. On the other hand the predictions for 1932 were verified quite satisfactorily.

Director R. WENDT, Bremen, reported on the German drift-net fishing for herring in 1931 ("Fischerbote" 1932, p. 43) which yielded a record catch of 416,341 Kantjes (i. e. sea-packed barrels). In June, in the Northern North Sea off the Orkneys, the drifters caught enormous numbers of comparatively small herrings belonging to the autumn spawning form of the western North Sea whereas they did not succeed in striking the large spring spawners which were caught in great quantities by the trawlers on the Fladen Ground.

In conformity with the Lowestoft programme of 1930, recommending investigation of the relations between the drift-net-caught and trawl-caught herrings we have endeavoured to carry out for this and for other purposes a continuous analysis of the stock occurring and being caught in the western North Sea during the whole trawling season from the end of June to the end of November 1932. The samples obtained from the fish market of Altona numbered twenty-five, containing about 5000 specimens. Fourteen of the samples were derived from the Fladen Ground and three from the Gut.

The total number of herrings examined in detail by Dr. LISSNER during 1932 amounted to 6000 specimens.

The working up of the material collected in 1931 was accomplished in the course of 1932, the racial investigations being continued in accordance with extended and new methods. As mentioned above, taking into consideration only the determinations of length, maturities and age, it was possible to establish the presence in enormous quantities of a quick-growing spring spawning race on the Fladen. This was confirmed by the racial investigations which also gave valuable results in the case of the autumn and winter spawners. The publication of these results has, however, been postponed in order to take into consideration the findings of the year 1932.

The analysis of the herring samples obtained in 1932 has been finished with the exception of the racial investigations. For the Northern North Sea it was possible to observe the remarkable phenomenon, that at the beginning of the season mostly younger fish — the four year old herrings from 1928 — were present and that as the season advanced these were replaced by five year old fish, derived from 1927, the year class which had formed the majority in 193 Taken as a whole, the five year old fish predominat in the North, though those of four years old we not far behind them in numbers. If we take into co sideration length, age and maturity of the fish, v are also able to recognise the presence in 1932 of t quick-growing spring spawning race, though t numbers of such were much smaller than in the pr vious year. The shoals on the Fladen in 1932 consist mainly of autumn spawners (formerly called ba herring).

The records of the places of capture and catch of the German drift-net fishing fleet continued, before, for 1931 and 1932 from the log books of t lugger captains have partly been plotted on cha but have not been published as yet.

During 1933 reports concerning the yield of t drift-net and trawl fishery in 1932 will be publish as usual and prediction of the character and co position of the stock in the approaching seas attempted. The data collected in 1931 and 1932 w be worked up together and published and it may expected that the question of the herring rac existing in the North Sea will be answered mo definitely and the relations between trawl caug and drift-net caught herring made clearer so th in the near future it will be possible to achie the determination of the character of the sto from fewer samples and thus gain time for oth urgent work.

The log books of the lugger captains for the yea 1931 and 1932 will be worked up and the recor plotted on charts for publication. New books will distributed amongst the captains to obtain recor of the 1933 fishery. E. EHRENBAUM.

Norway.

At the beginning of the year both mail steame plying between Bergen and Iceland (the "Lyra" a the "Nova") were fitted with sea thermographs. one of the journeys each quarter salinity samp (about 35 samples each trip) were collected. The fi of the ships to be fitted with a thermograph, one a a half years ago, was the "Nova". It plies betwe Bergen, East Iceland, North Coast and Reykjav returning by the same route every month. The "Lyr which was fitted with a Negretti and Zambra instr ment on 5th January makes fortnightly trips to Re kjavik via Faeroy so that the traverse and the su surface temperature is now registered on an avera every fifth day. OSCAR SUND.

Sweden.

Unfortunately the Swedish Research Vessel w unable to visit the region during 1932 but the wit material collected in previous years is being worked u ARVID R. MOLANDER.

Scotland.

While the investigations were centred round t study of the changes occurring throughout the ye in the populations of herring and haddock a gre

l of attention has been devoted by Scotland to investigation of the composition of the stocks of ll adolescent plaice within the territorial zone owing the introduction and extension of more nsive methods of fishing by small motor boats. he Research Vessel "Explorer" was kept in com-sion for nine months, operations being commenced y in March and concluding late in November. In v of the necessity for economy in coal consumption area surveyed was of less extent than in former rs. No investigations were carried out on the west of Scotland, south of the Minch. As in former rs routine hydrographic, plankton, and trawling ervations were made at selected stations on all ses, the itineraries to the offshore grounds being ertaken chiefly to maintain the continuity of ervations on the herring and haddock species. At rvals throughout the year investigation of the ulation of small plaice in the shallow zone of the tish East Coast was made and these researches e supplemented by trawling and seine net experi-ts with the motor boat "Enid". The motor boat kept in commission for ten and a half months. also investigated the small herrings and sprats ne coastal zone and carried out fishing experiments crabs and lobsters throughout the year.

rk at Sea.

ne following is a brief summary of the itineraries rtaken and of the main objects of investigation ach cruise.

ruary—March:

Investigations in the Firth of Forth by the Motor oat "Enid".

Examination of the small herrings and sprats in e boom net catches in the upper reaches of the rth of Forth. Capture of unscaled stages of the evious autumn herring brood. Collections of nthos and trawling observations on the small aice grounds.

ch—April:

Itinerary: Aberdeen — Fladen — Dornoch Firth Fair Isle — Hoy Head — Broad Bay — Butt of wis — Scalloway Bight — Lerwick — Viking nk — Lerwick — Aberdeen.

The age-composition of the haddock stock during e height of the spawning season on the northern d western grounds. Observations on the occur-ce of the newly hatched spring herring larvae. survey of the hydrographic and plankton con-ions within the transition zone during the spring m outburst.

l:

tinerary: The Firth of Forth and the inshore unds of the East Coast of Scotland.

ontinuation of the observations on the stocks small plaice on the several inshore areas. Dis-sal of the recently hatched herring larvae from Firth of Forth spring spawning grounds.

ntensive survey of the bottom fauna of Aber-n Bay by the Motor Boat "Enid".

May:

Itinerary: To the grounds lying south-east of the Firth of Forth as far as the north edge of the Dogger Bank, thereafter continuing observations to the "Gut" as far as Area G13 and from thence westwards to Aberdeen.

Determination of the distribution of the 1931 haddock year class in the area. Hydrographic and planktonic observations.

May—June:

Trawling observations on the inshore grounds of the Moray Firth by the Motor Boat "Enid". Repetition of the survey of the bottom fauna of Aberdeen Bay.

June:

Itinerary: Aberdeen — Lerwick — North Sound — Hoy Head — Pentland Skerries — Rattray Head — Moray Firth.

General hydrographic, plankton, and trawling survey. Co-operative hydrographic investigations with H.M.S. "Challenger" in the Fair Isle area. Age-composition of the haddock and whiting populations. Survey of the Moray Firth trawling grounds for comparison with pre-war years.

July:

Itinerary: Aberdeen — Area G14 — Fladen Ground — Orkney — Lerwick — Viking Bank — Lerwick — Bressay Shoal — Pentland Skerries — Fladen Ground — Aberdeen.

A survey of the great summer herring fishing grounds.

July—August:

Trawling observations on the inshore grounds of the East Coast of Scotland and of the Firth of Forth by the Motor Boat "Enid". Investigation of the upper reaches of the Firth of Forth estuary.

August—September:

Itinerary: Aberdeen — Area F13 — Area C14 — Area E15 — Area B17 — Lerwick — Scalloway Deep — Stornoway — North Sound — Area D17 — Pentland Skerries — Buchan Deep.

Continuation of the survey of the herring fishing grounds. Determination of the outer limits of the autumn herring spawning areas in the Northern North Sea and on the north of Scotland west of Orkney.

Repetition of the intensive survey of the bottom fauna in Aberdeen Bay by the Motor Boat "Enid".

October:

Survey of the area south of Aberdeen.

a) Coastal and Firth of Forth stations.
b) Southern section — Area B11 — Area F8 — Area H11 — Area F10 — Area C11.
c) Northern Section — Area C11 — Area H13 — Area F14 — Area D13 — Area C13 — Aberdeen.

Hydrographic and plankton observations. Frequency of occurrence and distribution of the various year classes of haddocks during the southerly feeding migration. The easterly and south-

easterly dispersal of the small herring larvae born in August and September on the more northerly spawning grounds.

Trawling observations on the inshore grounds of the Moray Firth by the Motor Boat "Enid". Investigation of the "winter" herring in the Inverness Firth.

November:

Itinerary: Aberdeen — Area D16 — Lerwick — North Sound — Sule Skerry — Hoy Head — Pentland Skerries — Area C16 — Dornoch Firth — Burghead Bay — Area C15 — Area C14 — Aberdeen.

Prevailing hydrographic and plankton conditions in the areas traversed. Frequency distribution of the various age-classes of haddock at the different trawling stations. Dispersal of the unscaled autumn hatched herring larvae.

November—December:

Trawling observations in St. Andrews Bay and in the Firth of Forth by the Motor Boat "Enid". Investigation of the small scaled herring in the Firth of Forth.

Repetition of the intensive survey of the bottom fauna in Aberdeen Bay.

Herring.

Observations were made *inter alia* on the young fry of fishes and on the general constituents of the plankton from March to November within the continental plateau, except for the western area south of the Minch. The examination of the inshore areas continued to give interesting results on the occurrence and character of the larger herring larvae at the period of transference to the scaled condition. During the cruises of the "Explorer" several localities were visited which had previously been weakly represented in the sampling.

The delimitation of the spring and autumn spawning grounds of the herring received major attention and as far as practicable over such a wide area diligent search was made for the appearance of the newly hatched larvae. Individuals of both broods were taken at the usual times and places and the only outstanding feature during the year was the occurrence of large numbers of the earliest stages on the "Ground Edge" of the Dogger Bank during the first week in October. Small larvae were captured in the region of the Viking Bank in April so that spawning had taken place in this area about the end of March.

The progeny from the Firth of Forth spring herring was again found to be restricted to the immediate neighbourhood of the Forth. No larvae were got south of Berwick or east of longitude 2° W. but a few were obtained in the bays northwards towards Montrose.

Numerous small larvae were secured round the north of the Shetlands during April so that this area continues to be an important spawning centre from which the resulting larvae radiate north-eastwards outwith the North Sea and round Flugga into t south-going stream of the western North Sea.

Captures of large spring larvae in June were e ceptionally few but positive records up to 30 mm. length were made immediately west of the Orkney on Bressay Shoal and in Buchan Deep. No spri larvae greater than 30 mm. in length were secur on offshore grounds but several up to 45 mm. we got by the "Enid" within the Firth of Forth in Jul Observations during the July cruise over the deep waters of the Northern North Sea showed a comple absence of larvae in all hauls. This absence of larv in July is an established feature of the investigatio

The distribution of the autumn larvae was, on t whole, normal throughout the period of the inves gations. They were, however, exceptionally numero west of Hoy (Orkney) and East of Pentland Skerr while they extended along the north of Scotland far west as the mainland grounds of the North Min during September but none was taken during t month at North Rona or at Stack Skerry. Th appeared, however, at these latter localities in N vember as medium-sized larvae.

Small larvae were taken also close to the Aberdee shire Coast in September and off Berwick in Octol but the numbers of larvae at other observation poi south of Rattray Head were exceptionally poor. T records suggest that the smaller larvae originati from the northern spawning grounds tended to mo in an easterly direction in the region of the Long Fort towards the N.W. Flats and the Great Fisher Bar

Transition stages of herring were secured with the estuary of the Firth of Forth in February, Ju and November. Those in February ranged in size fr 30 to 50 mm. and were unscaled forms of the previo autumn brood. Two series occurred in July, an u scaled group from 25 to 45 mm. in length wi characters of the spring brood and a scaled gro from 55 to 65 mm. with those of the autumn bro In November, a double series was again noted b the condition of the broods was reversed. The unscal larvae up to 45 mm. in length were undoubtedly autumn origin — mean number of vertebrae 56.57 while the scaled fish from 50 to 65 mm. with 56. as the mean number of vertebrae were diagnos definitely as the progeny of the Firth spring spawni herring.

Large numbers of small scaled herring, the p genies, mixed in varying proportions, of the spri and autumn spawners, the majority of which had n yet passed through their first winter in the scal condition were obtained from the following localit in the course of the year.

AREA	MONTH
Firth of Forth	March, April, July, Novemb
St. Andrews Bay	April, September.
Firth of Tay	December, January, Februa March.
Aberdeen Bay	April.
Moray Firth	March, June, October.

n the upper reaches of the Firth of Forth in March April there were present representatives of the mn brood of 1931 still in an unscaled condition scaled stages of the spring brood of 1931 with odal size of 9.5 cm. In July large numbers of the ng brood of 1932 with a mean size of 3.5 cm. had le their appearance in the upper reaches and this od was caught in large numbers as scaled forms November when they had reached a mean size of n. The latter were mixed, however, with smaller nbers of the scaled stages of the autumn brood 1931, now with a modal size of approximately cm. The relative abundance of the broods of erent origins was reflected in the commercial boom catches of small scaled herring. During the winter —1932 the ratio of autumn to spring progeny approximately two to one whereas in the following ter it was approximately one to three, the spring ponent now being the dominant element in the hes.

the Firth of Tay in the winter of 1931—1932 catches were composed almost entirely of small ings born in autumn 1930, while during the cur- winter individuals derived from the 1931 autumn ning were dominant.

n the other hand the catches of small scaled her- taken from St. Andrews Bay in April were mostly born in spring 1931, while the shoals in the Bay eptember were chiefly composed of individuals in the spring of 1932.

n the more northerly sections of the east coast component of spring origin was very poorly sented. In Aberdeen Bay in April and in the y Firth in March and June the samples caught nated chiefly from the 1930 autumn spawners n October and November the small scaled herring e Inverness Firth were almost exclusively in- iuals born in the autumn of 1931.

short, during the year, the shoals of small scaled ngs in the estuaries and coast zones were chiefly iduals derived from autumn spawners and only e Firth of Forth area did the component of spring n in mixed shoals reach any magnitude.

uring the year fifty-two samples from commercial es were dealt with. The total number of fish ined amounted to 15,500 and of these over 4,700 used for purposes of race investigation. It has possible to mount and read the scales of only t half of the total collected, although the scales arly all the herring used for racial purposes have prepared and examined.

nples have been selected from the different hs and different grounds and although much of aterial remains yet to be examined in detail it ssible to give a fair estimate of the composition e shoals.

e samples obtained from the Firth of Forth in uary, March and April consisted almost ex- ely of mature spring spawning fish. More than of the catches sampled consisted of compara- young fish with two and three winter rings inside the edge of the scale, i. e. year classes spring 1929 and 1928. Of the other age groups the only one of importance had four winter rings. The earliest spawners had for the most part three and four winter rings. The last sample obtained in April contained 69 % of fish with two winter rings.

The good catches obtained throughout the whole year in the Clyde estuary have been maintained chiefly by the brood hatched in the spring of 1928. This brood has been kept under observation since its appearance in the commercial catches during the winter 1929—1930. One sample of spawners caught in February 1932 contained 98 % of herrings belonging to this year class.

The early summer shoals at Shetland showed a high proportion of fish with three winter rings. The early spawning shoals consisted mainly of old fish with eight winter rings on their scales. The three-ring brood, however, came into prominence in the later spawning shoals, forming about one-third of the catches sampled.

The shoals from the Scottish N.E. grounds, between Peterhead and Orkney, were very uniform with regard to age composition throughout the whole season. Fish with three winter rings constituted from 51 to 73 % of the samples so far examined. The groups next in importance had four and two winter rings respectively, although neither of these was outstanding.

The age composition of the samples from Eyemouth grounds was closely similar to that of the samples examined in 1931. Before mid-summer the majority of the fish had only two winter rings, but during the spawning season fish with three winter rings came into prominence, constituting about 50 % of the catches sampled.

The herring from the Fladen ground were, as would appear to be almost invariably the case, on the average older than those caught on the Scottish drift-net grounds. Only two groups, however, were outstanding with three and four winter rings respectively. These were present in about equal proportions and together they constituted about 50 % of the fish obtained from trawl catches. Spawning shoals were located in August near Handa Island in the Minch. These herring, although slightly larger than those caught at the same time on the Scottish east coast, were very similar in age composition.

A sample obtained from Shetland on July 6th showed the mixed composition of the summer shoals in that area. Both spring and autumn spawning fish were present, and could be sorted out from each other according to their maturities. Fish at Stage I consisted mainly of spring spawners. Those at Stage II were derived from both spring and autumn spawning stocks, while those at Stage III and IV showed all the features of autumn spawning fish.

Racial analysis of autumn spawning shoals revealed a very close similarity in the numbers of vertebrae and K_2 in all areas extending from Shetland to the Berwick coast. The results of the racial investigations carried out in 1932 suggest that the proportions of

spring spawning fish in the early summer shoals off the Scottish N.E. coasts were much less than in 1930 or 1931, and probably as a consequence the catches in June and early July 1932 were less than at the corresponding period of 1930 and 1931.

It was possible to make a useful and interesting comparison between ripe autumn spawning fish caught near Handa Island in the Minch and less developed herring caught in Loch Shell near Stornoway. The former agreed in all respects with the autumn spawners of the North Sea, while the latter showed the features characteristic of spring spawning fish.

The fish caught on the Fladen ground at Stages I and II were of mixed composition but showed features which indicated a predominance of spring spawning fish. An advance in maturity was associated with a fall in the number of vertebrae and an increase in the number of K_2, so that fish at Stages IV and V showed a close similarity to the autumn spawners of the Scottish east coast. There has been, however, no evidence to suggest that the maturing herring which frequent the Fladen Ground in August and September spawn on our coast.

Haddock.

In the report for the year 1931 attention was directed to the numerical strength of the 1928 year class which, in spite of the thinning down of its numbers by fishing, formed the predominant element in the demersal population and was the mainstay of the haddock fishery throughout that year. The year 1927 had been bad for commercial stock recruitment and members of older year classes were scarce so that their contributions to the landings were correspondingly meagre. In addition, the two succeeding year classes of 1929 and 1930, although widely distributed over the area, were comparatively weak numerically in most of the numerous localities sampled.

It was also noted that the 1928 year class in its period of adolescence was spread in enormous numbers along the western border of the North Sea from Muckle Flugga (Shetland) to the Northumbrian coast and that at the end of its second year of life it was also located in numbers on the north and west of Scotland. Towards the end of the year 1931, however, there was evidence of the beginning of an exodus of this year class from the western grounds south of Rattray Head and that this departure northwards of fish preparing to spawn was not only early but very complete. Early in 1932 the main body of spawners was therefore to be found in the north and west.

The early appearance of representatives of the 1931 brood in the bottom water layers, their widespread distribution and their occurrence in dense shoals in localised areas towards the end of the year suggested favourable conditions for brood survival in 1931 and although it was then too early to access fully the strength of the recruitment to the demersal population it was evident that the members of this brood were more numerous in their first year of life than either of the two previous broods (1930 and 1929 respectively) and that their distribution was reminiscent of that of the prolific year class of 1928 in its first year.

During 1932 the greater part of the area was surveyed by the Scottish Research Vessel "Explorer" extensive trawling operations having been carried out from March to November with commercial otter trawl with small mesh covering over the cod end. Scale age-determinations on the whole of the catches secured have now been completed and the results of the investigations have amply confirmed the success of the 1931 year class. As predicted, the new brood with increasing size appeared as a flood of fish of small average size in the commercial catches. Omitting from our calculations the capture of the 1931 year class since all members of this brood had not taken to a demersal habitat until late in the year the following is the percentage age-composition of the entire catch made throughout the year.

Year Class	1931	1930	1929	1928	Older Fish
Percentages	75.5	6.0	4.0	13.5	1.0

Thus although many of the 1931 year class (especially in the earlier months of the year) were still below smallest marketable size the members of this brood contributed the greatest bulk of the "smalls" to the commercial catches. The surviving members of the prolific 1928 year class, however, were still more numerous than the combined progenies of the 1929 and 1930 spawners and in virtue of the additional period of growth they contributed by far the most important share to the catches of "large" haddock. The conditions in 1932 with regard to the age-composition and size-frequency distribution of the commercial catches were, in fact, very similar to — if somewhat less pronounced than — those which prevailed in the year 1924 when the catches consisted very largely of small and large fish belonging to the successful year classes of 1923 and 1920 respectively while haddock of intermediate sizes were comparatively scarce owing to the complete failure of the successive broods of the years 1921 and 1922.

As anticipated at the end of the year 1931 the exodus of the 1928 fish from the grounds south of Rattray Head to the more northerly spawning grounds proved to be very complete and owing to the paucity in numbers of the 1929 and 1930 year classes the commercial catches of haddock on the more southerly grounds were phenomenally poor in the first half of the year. It was not until late in the season that the catches in this area improved perceptibly. Improvement in the eastern section was due mainly to a much more intensive southward feeding migration of the older fish from the Viking Bank towards the Fisher Bank — a feature which has not been so pronounced for some years. On the western border, however, the influence of this southward feeding migration of the older fish in the late summer and autumn months was not felt to any appreciable extent further south than the Moray Firth and improvements in the com

cial catches south of Rattray Head were due fly to the upgrowth and entry of members of the ific 1931 brood into the smallest market cate-es. Throughout the year the 1928 year class was minent in the commercial catches from the thern and western grounds as is shown by the owing average age-composition of the shoals.

r Class	1931	1930	1929	1928	Older Ages
centages	52.0	12.5	8.0	25.0	2.5

contributed a substantial share to the catches in Moray Firth in the late autumn months.

he new brood — the progeny of the 1923 spawners vas first noted in the small mesh section of the wl catches in June when a few specimens were ght in the neighbourhood of Fair Isle. At this y date, however, most of the brood were still ng in the upper water layers and it was not until r and the following months that they began to ear in the trawl catches with any regularity. While difficult to assess accurately by these methods numerical strength of a brood in the first year ife owing to the fact that a proportion of the od is still feeding pelagically it is evident from results of the investigations that the 1932 brood, ot so successful as the prolific year class of 1931, not been a complete failure. The results obtained ar suggest, however, that when the entire brood aken to a demersal habitat its initial distribution differ markedly from that of the year 1931. While e catches were secured at localities in the west rkney and Shetland the most consistent catches ne North Sea were obtained in the deep water in the area circumscribed by the Great Northern y. The group was absent from the inshore grounds e Moray Firth and of the East Coast of Scotland the numbers caught in the late months of the on the offshore grounds south of Rattray Head negligible. Observations in the spring of 1933 be necessary to elucidate this point. The question ther the greater proportion of the brood has settled a in the deep water area is of considerable ical importance. It is the area of slowest growth for the North Sea for the adolescent haddock consequently new recruits are much slower in ng their influence felt in the market catches than which settle down on the shallow coastal nds and warmer and shallower waters of the er and Fisher Banks.

fore the end of the 1933 spawning season the bers of the 1928 year class will be greatly reduced shing operations and as members of the two eding broods are very scantily represented in opulation it is evident that later in the season ommercial catches will be composed largely of n their third year of life.

Plaice.

ring the year 1930, when detailed inshore igations were first instituted, the survey was necessarily of a preliminary nature and directed mainly to selecting the most suitable grounds at which periodic observations could be conducted without excessive loss of gear. Conditions along the great extent of the Scottish coast are extremely varied and hence during the year 1931 the prominent feature of the programme of the Motor Boat "Enid" was the sampling of suitable representative localities at different seasons, and during the year under review the investigations have been directed in large measure towards maintaining continuity of observations of the various selected representative localities.

Trawling was the principal method employed for sampling the populations of small plaice in the bays and the recognised treatment accorded the material collected during the year has revealed several notable features. These concern the 0-group (1932 year class), the numerical strength of the I-group (1931 year class) and the growth rate of the latter.

It was evident from observations made in the summer months that, except in the case of St. Andrews Bay, the 1932 0-group was not likely to be so numerous as was the case with the 1931 0-group. In the previous year positive records were obtained as early as June, whereas in 1932 there was no occurrence of the group, except in St. Andrews Bay, until October. This was borne out by a comparison of the figures for the different areas for the two years. In 1932 the Firth of Forth captures for equivalent fishing time were 73 % of those for 1931, in the Moray Firth the percentage was only 50, while in Aberdeen Bay despite repeated trials throughout the season not a single representative of the group was obtained in the catches. On the other hand, in St. Andrews Bay in 1932 the numbers of 0-group plaice captured exceeded those of the previous year, the percentage being 147. In all areas combined the percentage was 70. The observations show conclusively that the abundance of the 0-group not only varies greatly on different sections of the coast in the same year but may also vary greatly in the same locality from year to year, the irregularities in recruitment probably being due mainly to variations in the current systems on the coastal plateau during the period of transportation of the pelagic eggs and larvae.

In 1932, as in 1931, there were no appreciable differences in the mean sizes of the 0-group on the different sections of the coast. The mean size in all areas was higher, however, in 1932, being 9 cm. at the end of November as compared with 8 cm. in 1931.

The most outstanding feature of the catches was the predominance over all other groups on the grounds fished by the "Enid" of Group I, the 0-group of 1931. It would appear from a comparison of the numbers obtained as 0-group in 1931 and the numbers obtained as I-group last year that a precise estimate of the numerical strength of a new brood cannot be made until it has entered its second year of life. Prior to this large numbers must be too close to the shore to permit a vessel even of shallow draught like the "Enid" to work with safety.

With regard to the growth rate of the I-group this was found to be generally much slower than that of the corresponding group in 1931 as the following shows.

Area	Approx. Mean Size 1 year 8 months Group I 1930 Year Class	Group I 1931 Year Class
Inverness Firth.....	12.5 cm.	12.0 cm.
Dornoch Firth.....	19.5 -	14.5 -
Nairn Bay.....	15.0 -	12.5 -
Burghead Bay.....	19.0 -	14.5 -
Spey Bay.....	18.0 -	15.5 -
Aberdeen Bay.....	18.5 -	15.5 -
St. Andrews Bay....	13.0 -	14.0 -
Largo Bay.....	19.0 -	16.0 -
Aberlady Bay.....	17.0 -	16.5 -

The general fall in growth rate on practically all sections of the coast from that of the preceding year might suggest a common cause such as temperature but for a fuller consideration of the question the data regarding the amount of food on the different grounds and the amounts consumed by the different sizes of plaice would have to be available.

The II-group (year class 1930) did not form at any period of the year a higher proportion of the population than 25 % except in Inverness Firth and in Largo Bay. These two excepted areas were also of interest in respect of the growth rate of the group, the mean size of which at the end of November was 17.0 cm. in Inverness Firth and 28.0 cm. in Largo Bay. These were the extremes of the mean sizes on the whole east coast, the results from all other areas falling between 21 and 26 cm.

Older year classes formed five per cent. or less of the population on all grounds except in Inverness Firth (38 %), Largo Bay (19 %) and St. Andrews Bay (15 %).

In St. Andrews Bay the prolific year class of 1927 and the very poor year class of 1928 were found to have dwindled to less than one per cent. of the total population. This caused the area, notably a small plaice one, to become one of a still smaller sized stock consisting almost solely of the year classes 1929, 1930 and 1931.

Detailed investigations of the populations of small plaice on these inshore areas have been in progress for only three years but it is obvious that in addition to a study of the food and feeding habits of the young growing plaice much more precise knowledge is necessary regarding the variations in the amounts of food annually available in each area. The systematic collection and examination of the contents of the stomachs of different sizes of plaice from each area has now been in progress for two years and during last year there was initiated a dredging programme from the results of which it is hoped that ultimately a fuller knowledge may be available as to the distribution of the benthic food organisms and the causes of their annual variations in abundance in the different areas.

Hydrography and Plankton.

In accordance with the policy which has been pursued now for a number of years, routine hydrographic and plankton operations were always closely linked up with the biological work carried out on all cruises of the research vessel. The scope of these investigations during the nine months the vessel was in commission may be ascertained from the itineraries of the different cruises. During this period 246 hydrographic stations were occupied by the "Explorer" resulting in the observation of 1685 temperatures at specified depths from surface to bottom and the simultaneous collection of 1682 water samples for salinity determination by the Government Chemist. In addition 66 oxygen analyses were made of the water in the surface, intermediate, and bottom layers at twenty-two stations on the July cruise in the Northern North Sea. Throughout the year investigations on the surface currents were continued by means of surface drift bottles liberated at 159 stations. To date a return of 26 % of the number of bottles liberated has been effected, the geographical distribution of recoveries being as follows:— British shores 94; Danish and Schleswig-Holstein coasts 22; Sweden 34; Norway 260; at sea 3. The extraordinarily large number of Norwegian recoveries are representative of experiments begun in all nine months during which the work was carried out and also of liberation stations widely scattered over the entire region surveyed.

In addition to the foregoing operations of the "Explorer" in 1932, opportunity was afforded early in June for a number of the scientific staff to participate in a short hydrographical cruise in the north-western area of the North Sea on board H.M.S. Survey Ship "Challenger". Besides the usual temperature observations and water samples collected for salinity measurements at sixteen stations, additional samples were procured from the same points for oxygen analyses and hydrogen-ion determination. A number of drift-bottles also was despatched. In this connection too the department has to acknowledge the assistance rendered by the English Research Vessel "George Bligh" in putting out surface drifters in the month of July in the area lying west and south of the Outer Hebrides.

All the above data, excepting the drift-bottle results, will appear in due course in the "Bulletin Hydrographique" for the year under review.

There is no doubt from a preliminary scrutiny of temperatures and salinities that hydrographically the year 1932 was peculiar in the Northern North Sea area and vicinity. Temperatures were above normal during the period of operations, the deviation being as much as $1\frac{1}{2}^{\circ}$ to 2° C. in certain areas in the summer. In this season also salinities tended to be higher than usual, some extraordinarily high values being recorded, especially from intermediate and bottom layers.

Oxygen samples taken in the Northern North Sea

n July showed the surface to be supersaturated with ntermediate layers generally from one to five per ent. below saturation and bottom layers about ten er cent. under saturation point.

The continuous examination of the general consti-uents in the plankton over a long series of years uring the process of sorting out all the young fish om the collections has resulted in the accumulation f valuable data. A working knowledge has now been ained of the normal conditions existing within the rea of the Scottish investigations so that abnormal appenings can be readily detected. Unusual appear-nces of Salps, Doliolids, Squids etc., forms which re normally exotic to the area, have been noted in ifferent years, and it has been assumed from these ccurrences that the Atlantic water which impinges n the Scottish coast may be derived from different ources in the Atlantic in different years. During ovember of the current year an exceptional occur-nce was the appearance of the pelagic Tunicate, *yclosalpa bakerii*, along the north of Scotland and the Fair Isle passages. This is a form which had ever been recorded in Scottish waters or in British as until it was observed in considerable numbers the S.W. coast of Ireland by Farran of the Irish Fisheries Service during August of the year under review (vide ‚Nature', Feb. 18th 1933). The head-quarters of this species appears to be in tropical waters, so that its appearance along the north of Scotland as late as November in both the solitary sexual and the sexual chain forms may have had some significance. The presence of another pelagic Tunicate, *Doliolum* sp., was observed during August and September from the Butt of Lewis to Muckle Flugga, at Fair Isle, East Orkney and on the western edge of the Bressay Shoal. This species was noted for the first time in twenty-five years during August 1928 (vide 47th Annual Report Fishery Board for Scotland) on the west and north-west of Scotland and again in the same area during August 1931. *Salpa fusi-formis*, however, did not make its appearance in the area during the year under review.

Another interesting capture during November of this year at Stack Skerry was an adult fresh water Stickleback (*Gasterosteus aculeatus*). This is the tenth record of this species in offshore waters during a long period of years, the others having been taken chiefly during the spring months off Thurso, at Foula Bank, Fair Isle, Smith Bank, East Orkneys, Mar Bank and at position 57°30′ N. 1° E.

SOUTHERN NORTH SEA

1932.

By

W. Mielck.[1])

PRELIMINARY

The scientific meeting in Copenhagen on June 24th 1932 may be regarded as a red-letter day in the tory of the biological and fisheries research work thin our area. The question dealt with, whether the tch of undersized fish is harmful or not to the rketable stock, has for a long time been of the most importance in our area, as is well-known, l more especially with regard to the plaice. Since beginning of the international investigations we ve had a number of summary reports based on results of the participating scientists in the dif-nt countries, those of 1913 and 1925 may be cially mentioned, and the answer has been in the rmative; the same answer has to be given this e. In the year 1925 the older undersized fish were cially referred to as requiring protection, that is, sc which had already lived several years on the ilable food and would reach marketable size the course of the next two years. The investi-gations continued since then with improved methods in all the countries interested in the plaice fishery — regarding which a report was made on June 24th, — have led essentially to the same result. At the same time they have tested the objections which since 1925 have come from various sides against protective measures. Objectors referred to the natural fluctuations of the stock, at that time not sufficiently investigated, and averred that the differences between richer and poorer year-groups may be so great that protective measures would be ineffective. Further instead of protection a regular thinning of the stock by removal of the undersized was recommended, so that those remaining would, owing to reduced com-petition for food, grow faster and thus lead to an increase in the quantities of marketable fish. According to the investigations of 1926—1932 both of these contentions are erroneous. The discoveries made regarding the natural fluctuations of the stock have given the result, that a succession of two or even three poor year-groups must influence the product of

[1]) Compiled from information placed at the Chairman's osal by members and collaborators of the Committee.

the fishery, inversely as the year-groups becoming marketable in the following years have been protected. A regular thinning of the stock has proved unjustifiable from the experience gained in the recent years. In this connection the example of the Danish seine fisheries is very instructive. This kind of fishing, which protects the undersized fish to a very great extent, shows the best results both quantitatively and qualitatively. This is also borne out by the scientific estimates, which have been based on the results gained in recent years by a number of different methods for the first time laid before the scientific meeting, namely that the wider the mesh of net used in the fishery the better is the product, owing to the fact that more fish are protected before they reach the marketable size. This conclusion holds good even when we take into account a marked delay in the growth of a denser stock due to the protection.

Whilst the question of the harm done by removing undersized fish must undoubtedly be answered in the affirmative, so far as the older, young plaice taken on the grounds of the deep-sea fishery are concerned, it remains open in the case of the two earliest year-groups which live close to the coast and thus are outside the range of the deep-sea fishery. The favourable influence of a thinning of the stock in order to obtain a more rapid growth cannot be denied, provided that the weeding out process occurs in the earliest years.

This weeding out process has, to a large extent, been carried on for a number of years in the coastal so-called »Grusfischerei« (shrimp fishery) for the supply of the fishmeal factories, especially on the Belgian, German and Dutch coasts. On the Belgian and German coasts the fishery is restricted for the most part to the coastal zone and to the earliest year-groups. The Dutch shrimp fishery is carried on mainly farther out, and the older small plaice are taken, so that here in all probability considerable harm is done to the marketable stock. Two publications which have appeared during the year of this report have now furnished details regarding the quantities taken on the Belgian and German coasts. How far this thinning of the stock is of advantage and when it begins to be harmful for the catch of marketable fish, cannot so far be determined. Without any doubt it should be a main objective of future investigations to follow these fisheries with particular attention and to note their influence on the stock, a matter referred to also in the conclusions of the scientific meeting (cf. Rapp. et Proc.-Verb. LXXXI, pp. 30 and 102, ad 3).

For the rest, during the year of this report, the work at sea and in the laboratory has again been carried on actively in every branch of the investigations, and the regular co-operation of the participating countries has again become closer and more pr ductive.

The allocation of the work on the plaice investig tions, begun in the year 1931, has been retained. Th continental countries Denmark, Germany and Ho land undertook the regular investigation of the ag composition of the stock on the young-fish groun from Horns Reef to off Ymuiden, whilst on the En lish side the marking experiments were carried o extensively. The market measurements of plaice a now made according to agreement in all the countri interested in the plaice fishery.

The concerted study of the question, whether th herring taken by trawlers and drifters are of the sam or different stocks, has also been continued.

The census taken of the stocks of the importa food fishes, such as herring, plaice, sole and haddoc has yielded also such a deep insight into the streng of the year-groups composing the catches, that several cases it enabled forecasts to be made, whi have proved to be correct.

Regarding the causes of the fluctuations in th strength of the year-groups our knowledge is ver slight. This problem has also been attacked. In th case of the plaice it seems very probable that th incidence of good year-groups coincides with the pr valence of south-west and southerly winds in the fir two months of the year, whereas in bad years at th time the winds are mainly from the north to east. may be supposed therefore, that the increased influ of water into the Southern North Sea, caused l westerly winds, favour the transport of the fry fro the most important spawning ground in the Dee towards the nursery grounds lying along the Dut and German coasts.

In connection with this question of the causes the fluctuations in all the fish stocks belonging to t Southern North Sea we have to recognize the fund mental importance of the work carried on by t English hydrographers in the Channel and in t Flemish Bight by means of regular and systema investigation of the direction and strength of t current in different years and months. The decli in the influence of the Channel current on the South North Sea, which was noted in 1931, continued i the year 1932. Further information regarding this w be found in Section E; many of the biological p nomena referred to in the Sections B III 5 and may be explained by reference to these hydrographi conditions.

The Committee wishes to express its sincer thanks here for the valuable support given to th labours by numerous companies, captains and cre of the fishing boats, lightships and fishery protect vessels of all participating countries which are s cially mentioned in the following sections.

A. WORK AT SEA

elgium.

The hydrographic ship "Victoire" has recently been ade available for general work during the winter onths, but unfortunately was not ready for work time for the herring and sprat season. Hydrographic nd planctonic work has been carried on from the shery cruiser "Zinnia" on the line Deal—Gravelines; n board the lightvessel "West Hinder" daily observaons and weekly samples of plankton and water mples for analysis have been obtained. A small otor tug is being fitted up for littoral work during e summer.

enmark.

The "Dana" worked in the North Sea from the end April to the beginning of June — mainly from the 0th April to the 6th May — off the Jutland coast tween the Skagerak and Esbjerg; one station with e ring trawl at Jutland reef and eight stations with e Petersen grab between Jutland reef and Horns eef, 19 stations with the otter trawl and Petersen ab in the Horns Reef area. Then, from the middle May to the 8th June, the middle North Sea was vestigated, approximately between the line Esbjerg Humber in the south and 58° Lat. in the north. In is, plaice marking and transplantations from the ua Dyb area to the Dogger Bank took place. In dition, there were investigations on the haddock d on fish brood as well as collections of bottom mples and hydrographical investigations.

The "Japetus Steenstrup" carried out experiments th the eel-seine in Nissum Bredning on May 5—6 stations) and August 21—22 (6 stations).

ngland.

The "George Bligh" was in continuous commission the area from the beginning of May till the middle December, except during August when she carried t hake investigations in another area. Ten voyages all were carried out as follows:— two for experintal work on trawls, two for plaice marking; six plankton. and hydrography. Co-operation with a hery patrol vessel was again secured on one of the drographical voyages. The "Onaway" was in conuous commission throughout the year and carried t work on the sampling of herring and sprat shoals, well as plankton and hydrographical work.

The work at sea of the English fish measurers, the time work of current measurements on lightvessels d surface sampling on steamship routes have been ntinued, thanks to the courtesy of Trinity House, d the owners, masters and officers of the vessels ncerned.

ance.

The French co-operation was continued in the form daily observations at the "Sandettie" lightship: meteorological observations, collecting water and plankton samples at the surface and bottom regularly every 2 hours before and 3 hours after highwater. In the course of the year the following 12 voyages were made. March: "Jean Bart" hydrographical observations on the *Pecten maximus* grounds (eastern part of Channel). The trawler "N. D. France" hydrographical observations (surface) in eastern part of Channel. April: The trawler "Asie" hydrographical observations (surface) on the voyage from Grisnez to Bergen. June: Drifter "Alexandrine" hydrographical observations (surface) in the Channel on the line Boulogne to Start Point. Trawler "Provence" hydrographical observations (surface and bottom) in the eastern part of Channel on the mackerel fishing grounds south-west of Beachy Head. July: "Petite Gilberte" measurements and biological observations at the Varne mackerel fishery. August: "Capitaine Armand" 1) hydrographical observations (surface) in eastern part of Channel on the line Boulogne to Start Point; 2) hydrographical observations (surface) in the North Sea on voyage from Boulogne to Fladen Bank. Cruises of the "Sentinelle" and "Estafette", hydrographical observations on the fishing grounds of the herring drifters. September: "Turbot", biological observations at the mackerel fishery off Boulogne. October: the trawler "Excellent", hydrographical observations (surface) on the line Boulogne to Start Point (East Channel).

Germany.

With the "Poseidon", from April 15 to May 2, investigation of the German Bight was made on the usual 6 sections at right angles to the coast (6 stations on each section) between Borkum Reef and Horns Reef; further 2 sections in the adjacent waters, in the north off Ringkjøbing Fjord (4 stations), in the west off Ameland (6 stations). The main objects were: 1) census of the stocks of plaice and sole; further comparisons of trawl catches with and without covered cod-end; observations on the distribution of sprat and young herring; 2) work with the Petersen grab; 3) young fish and plankton investigations; 4) hydrographical observations.

On numerous cruises with the "Augusta" the stocks of plaice and sole in the Heligoland Bight were controlled and further comparisons made between the catches of the cutter's trawl with and without covered cod-end. During the months of December to April the investigations which have been carried on for several years on the herring larvae near Heligoland as also in the mouths of the Elbe and Jade were continued. — The regular hydrographical observations at 9 German lightships in the German Bight and in the Heligoland Roads and on steamer routes have also been continued.

A patrol cruise of the "Weser" over the herring fishing grounds in the south-west area of the North Sea from November 15 to December 15 was utilised

for the collection of data regarding herring larvae, plankton and the hydrography of the Southern North Sea and Flemish Bight.

Supplementary to the plaice investigations on the German fish-markets a voyage was made with a deep-sea cutter in the German Bight in the month of July. A greater number of such voyages is planned for the future.

Holland.

On the part of Holland, the plaice stock off Ameland to Ymuiden was investigated in May by the research-vessel "Nautilus" in the same way as in 1931. Further, a hydrographical cruise was made in November in the Flemish Bight according to a special plan drawn up by the Belgian, Dutch, English and French collaborators (Lowestoft, October).

Norway.

The Norwegian co-operation in our area was restricted this year to the regular observations on temperature and salinity by steamers on the routes Bergen—Newcastle and Bergen—Rotterdam.

Scotland.

On two separate occasions the Scottish Research Vessel "Explorer" made excursions into the Southern North Sea across the line Berwick—Lindesnaes to extend the chain of observations carried out further north.

On both cruises trawling experiments with commercial otter trawl with fine mesh covering over cod-end were made. In addition to the routine observations made on the trawl catches, serial hydrographic and plankton collections were obtained from selected positions. On both occasions surface drift bottles were liberated at the various observation positions. — In May six of the observation stations were equally spaced along the line Berwick—Lindesnaes, the most easterly station being situated at 3°10′ E., while six observation stations were chosen in the area between that line and the north edge of the Dogger Bank. In the month of October the same area was surveyed but on this occasion twelve observation stations were selected in the southern section.

B. FISH

I. General.

1. Statistics and Ichthyometrics.

In the renewed market measurements at Esbjerg 11,058 plaice were measured (in addition, 3,614 plaice during the transplantation from the North Sea to the Belt Sea and Sound).

The collection has proceeded in England without change of method. The numbers of the chief species measured are approximately as follows:

At Sea

Plaice	Haddock	Cod	Herring	Soles	Brill	Turbot	Total
67,800	48,400	10,100	15,400	820	320	330	143,200

On the Markets

Plaice	Haddock	Cod	Herring	Total
51,400	33,500	10,800	55,300	151,000

Measurements of haddock made at sea have been placed at the disposal of the Fishery Board for Scotland.

A paper is just printed (Journal du Conseil), dealing with the application of some modern statistical methods in certain branches of fishery research. It takes the form of a constructive criticism of the methods used in a recent paper on distinguishing "races" of herring by means of the number of vertebrae. The modern methods discussed are, however, of very wide applicability.

The measurements carried out in the Boulogne Laboratory or on board French fishing vessels were mainly concerned with the mackerel and herring. More than 15,000 mackerel and 5,000 herring of varying origin have been measured. The remaining measurements dealt with the hake, green cod, whiting and flat-fish.

The following measurements were made by Heligoland biologists at sea (from research vessels and fishing cutters):

Plaice	Other fish	Total
65,160	24,322	89,482

Market measurements on North Sea fish[1]) made in Cuxhaven, Hamburg-Altona and Wesermünde numbered:

Plaice	Other fish	Total
13,838	263	14,101

The investigation begun some years ago at Wesermünde into the methods of collecting the German sea-fisheries statistics (e. g. composition of the landings, trade categories, fishing grounds and duration of fishing and voyage) and regarding the usefulness of the data in published statistics for biological questions was continued. A publication on the subject is in preparation.

At the Ymuiden fish-market weekly measurements of plaice and haddock were made (plaice small II and haddock small II).

2. Littoral fishing.

A new report has been published on the Belgian coastal fishery[2]). Since the previous report (192

[1]) Other investigations in Wesermünde on fish from the Barents Sea and Bear Isl. (17,308 fish) and Iceland (1,1 fish).

[2]) Gilson, G.: Destruction du jeune poisson par pêche littorale à moteur. — Annales de l'Institut d'étud maritimes d'Ostende, Mémoire No. 2. 1932.

ne important changes have taken place in the lustry. The cutters have been provided with motors, minimum size for various food fishes has been ne away with and the landing of the by-catch, nsisting in great part of young fish destined for fish-meal factory, has been permitted. The truction of undersized fish in the Belgian coastal nery has thus increased quite considerably. This is wn by a comparison of the landings from May 32, the total food fishes present being determined samples, with the data for earlier years (May 1926 d average for the years 1905—1926). The re-introtion of the minimum size is considered desirle. Even if the coastal waters are overpopulated, more rational proceeding according to the author uld be, to counterbalance this by means of extensive nsplantation of the young fish from the coast out the open sea rather than destroy them. Investigans on the theoretical basis and practicability of the nsplantations are thus necessary.

An enquiry into the destruction of young fish ulting from the coastal fishery has been ordered by Belgian Government and entrusted to the Institut ritime d'Ostende. One of the greatest difficulties countered in the protection of young fish lies in the portance of the shrimping industry on most of coastal nursery grounds. Neither local nor seasonal hibition can be applied to inshore fishing without ping and completely annihilating the shrimping. neral regulation of the size of meshes is impossible hout preventing the catch of shrimps. Prohibition he landing of young fish under a minimum size ears more than ever to be the only possible method preventing the destruction of young recruits and uring the normal preservation of the stocks of t of the food fishes. In consequence of these conrations the Belgian investigator has carried on tinuous work both on the biology and the fishing he common shrimp. He has been advocating the ssity of an auctional market for shrimps in order btain statistical data concerning the total quantity ed and the value of the annual catch of that very portant branch of the Belgian fishery. He has also ted out the desirability of some protective sures in favour of the shrimp fishery itself and articular for the preservation of millions of very g shrimps destroyed by incomplete and tardy g of the catch. The sale of quantities of shrimps aining too high a percentage of "smalls" under nimum size ought to be prohibited and baskets ated.

England investigations have been made on g herring and sprat in the East Anglian area. study of the periwinkle (*Littorina littorea*) has continued at Maldon and an experimental tigation of the growth of this species is being d out at Yarmouth.

the French coast further investigations have made on young herring, sprat and small cod. e results of the German investigations in 1929— the small flatfish landed as bye-products by the shrimp fishermen have been published[1]). Carefully made estimates in this show, that the numbers of the young plaice growing up in the German Bight are reduced about 10 % by the shrimp fishery. These young plaice, however, are almost exclusively in the first or second year of life when taken, so that this loss is most probably counterbalanced by the more rapid growth of the remainder. This view is supported by theoretical considerations (cf. B, 1, 7. Methods). Official limitation of the shrimp fishery cannot be recommended on the basis of the results.

3. Eggs and Larvae.

Observations on the distribution and quantities of pelagic fish fry were made on the voyages of the "Dana" (see B. II, Cod), "Poseidon", "Augusta" and "Weser" (see B. III, 4). The plankton material collected at the "Sandettie" lightship has also to be examined for its contents of eggs and larvae.

4. Food of Fishes.

In England the investigations on the food of the herring (see D) and sprat (see B. V) have been continued. This holds good also for the fish species regularly investigated by the French workers. The German publication, announced in the previous report, on the food of the flat-fishes and gadoids in the south-eastern parts of the North Sea has had to be postponed till 1933. The chemical investigation begun by the Heligoland Institute on the food-value of the principal species of lower animals devoured by fishes has been further advanced.

From the Scottish side further samples of stomachs of the different length-groups of haddock have also been collected in our area at all trawl stations of the "Explorer", for the study of the food and feeding habits of this species.

5. Marking experiments.

A report on plaice marking experiments is given below (see B. IV. 7).

The experiments begun last spring by the French biologists on the marking of *Pecten maximus* have not yielded any positive result.

6. Experiments on the catching power and sparing quality of Fishing Gear.

During English experiments further confirmatory data have been procured that the majority of fish escape through the meshes of a cod-end during the operation of towing. Experiments were carried out with a new type of commercial cod-end. Work was

[1]) Wulff, A. und Bückmann, A.: Der „Gammelfang" der Garnelenfischer und die Bedeutung des Fortfanges junger Plattfische für den marktfähigen Plattfischbestand der Deutschen Bucht. — Bearbeitet nach Untersuchungen von A. Schubert. Wiss. Meeresunters. N. F. Abt. Helgoland, XIX, 1. 1932.

also carried out with special drift-nets on a commercial drifter (see B. III. 1).

The experiments begun by the Heligoland workers in the previous year, to compare the catching power of the seines and wide-meshed trawls used by the fishermen on the one hand with that of the covered cod-end nets now exclusively used in the scientific hauls on the other, could only be continued on a small scale. In a larger experiment for the purpose of comparing the catches of the steamer trawl and cutter trawl with and without covered cod-end the following number of fish was measured: 20,251 plaice, 2,831 other fish, total 23,082.

7. Methods.

Reference has already been made to an English report which is to be published shortly (see B. I. 1)

To reach an answer to the question, whether the destruction of undersized fish is harmful to the stock or not, a method of calculation has been worked out from the German side, which enables us to estimate with certain presuppositions the quantities available from a fish stock, given the strength of increase, the nature and intensity of the fishing, regard being taken of the rate of growth conditions. A report has been published on this calculation and its results[1]).

Trials with methods for the capture of herring larvae were made from Lowestoft in spring and from Heligoland during last winter.

II. Cod and Haddock.

Cod. The work by M. Graham on the North Sea Cod, referred to in last report, is to be published shortly, probably in two parts: "General" and "Prediction". Measurements of market categories are being continued in order to keep a watch on the stock.

A remarkably high number of cod larvae was found by the "Dana" on April 30 over the Jutland Reef, e. g. in hauls of 30 minutes with the ring-trawl: 1,686 larvae in 5 m. and 3,684 larvae in 20 m. depth.

Haddock. On the May voyage of the "Dana" catches of haddock were investigated, chiefly on the Dogger Bank and between this and the west coast of Jutland. The year class 1931 made up approximately 81 % of the stock, and appears, according to the British, Danish and German investigations, to be a rich year-class. Preliminary investigations were begun on the length of the fish and the age of their first maturity. The haddock were so scarce in the German Bight between Horns Reef and Borkum Reef in the month of April 1932, that only a single specimen was taken in the numerous hauls of the "Poseidon" on the 6 sections (36 stations). Farther out, in the southern Clay Deep moderate numbers were obtained and samples of the scales taken.

A report on the market measurements of 1929, chiefly in Wesermünde, has appeared[1]). In 1932 th investigations on the North Sea haddock had to b interrupted owing to the pressure of other wor Their early resumption, however, is being planne

The working up of the material, collected by th "Poseidon" since 1902, on the haddock in the south eastern parts of the North Sea has been continue

At the Ymuiden fish market weekly measuremen of haddock were made.

The main object of the Scottish trawling obse vations within the area was to extend our knowled of the occurrence of haddock of different age class in the more southerly limits of their distribution. A haddocks caught were measured and copious sca samples secured for age-assessment. The scale da are being used as an aid to the analysis of the ha dock ichthyometric data collected by the Ministry Fisheries (England) on commercial vessels. Lar samples of haddock stomachs were collected from t different size groups at all trawling stations for t study of the food and feeding habits of the specie

As stated in the report for 1931 there was eviden in November of that year that the new year cl was likely to prove more successful than either the two preceding broods, but that it was then t early to assess accurately the numerical strength the new recruits. The results obtained from the o servations made on the two trawling cruises duri the year under review show that the haddocks bo in 1931 had then become the dominant year cl in the area. The following are the percentage ag compositions of the demersal shoals in May a October respectively.

Age class	1932	1931	1930	1929	1928	Older classes
May	—	80.3	6.0	7.7	5.4	0.6
October	1.8	90.3	1.8	2.7	3.1	0.3

In spite of the fact that the 1928 year class h suffered diminution both by fishing operations a emigration, it still compared favourably in numb with those of the two poor brood years of 1929 a 1930. During the autumn feeding period the 19 year class was augmented by immigrants from t north especially at the eastern portion of the ar This feature was more clearly evidenced in the co mercial catches.

Very few of the new brood (1932) were caught early as the month of October although very mu larger numbers were obtained in the same month positions further north. The distribution of the nu bers of the 1932 brood which had attained a demer habit suggested that the area south of the line B wick—Lindesnaes has only been very sparsely p pulated, the greater proportion of the new bro having settled down in the deeper waters of t Northern North Sea.

[1]) Bückmann, A.: Die Frage nach der Zweckmässigkeit des Schutzes untermassiger Fische und die Voraussetzungen für ihre Beantwortung. — Rapp. et Proc.-Verb. LXXX. 1932.

[1]) Lundbeck, Johs.: Marktmessungen an Nordsschellfischen im Jahre 1929. — Ber. d. D. W. K., N. VI, 2. 1932.

III. Herring.

Statistics. Analysis of Herring catches. Fishing Experiments. Year-class Composition. Forecasts.

In the Lowestoft Laboratory the usual examinations of the shoals of fish which appear on the East Anglian grounds have again been carried out, with view to obtaining more data relating to the rate mortality of these fish. The usual procedure was opted, that is, four samples of herrings were amined each week at the laboratory, and concurntly two measurers were employed during the ason, measuring the herrings as landed on the arket. Altogether, 27 samples were examined at the boratory — rather less than last year — and 55,266 rrings were measured on the markets at Yarmouth d Lowestoft. The main age-groups in the fishery re the fives and eights, and the results of the forest, issued in the "Fishing News" in August, again owed that the knowledge of the East Anglian fishery becoming substantial.

In addition, experiments with mixed fleets of ft-nets have been carried out at North Shields and Lowestoft, during the past year. The most important rk in this connection was that done at Lowestoft October and November, when it was clearly shown the average commercial mesh was much too all for the reasonable exploitation of the fishery. detailed results of these experiments are at sent being worked up, and will be published shortly.

At the Boulogne-sur-mer laboratory study of the ring populations of the south-western North Sea l eastern Channel still formed the special object the regular investigations. The analyses of the ring catches undertaken during the winter season 32—1933, so far as they have yet been worked up, ded the following results: (Table I).

The year-groups 1922, 1924, 1927, which had ady been shown to be good previously, are also minant in the season 1932—1933, whereas the yearups 1923, 1925, 1926 and above all 1928 have in proved to be failures.

The new year-group 1929, which appeared last ter in the shoals for the first time, promises to be y rich.

A report on the material for 1931 has been published[1]).

The good results of the German trawl herring fishery in the year 1931 have been shown in a report[2]). In the whole North Sea at that time the 4-year old herring of the group 1927 were dominant. Nevertheless the fish of the Northern North Sea differed considerably from those of the Southern North Sea. In the north, as the racial investigations showed, the fish were mainly spring spawners immigrating from the Atlantic, distinguishable by their considerable length of about 27 cm. In consequence of the strong incursion of these spring herring the forecast made by the Hamburg investigators for 1931 has not been fulfilled. On the other hand that made for 1932 has held good.

Further, a report has appeared on the likewise very successful catch of the German drift-net fishery in the year 1931[3]).

The continuous observation of the herring stock of the Western North Sea has been maintained by the Hamburg biologists. In connection herewith, pursuant to the Lowestoft programme of November 1930, the task of comparing drift-net herring with trawled herring was undertaken. During the period from end of June to end of November 25 samples were taken on the Altona market. Of these 8 came from our area (Dogger Bank), the remainder from the Northern North Sea (Fladen and Gat). On the fishery patrol vessel "Elbe" (3.—31. VIII) 5 samples of trawled herring were collected from the area west of the Gat; further, a sample at the end of October came from the shallow part of the Dogger Bank. Altogether more than 6,000 herring were examined in the year 1932.

The analysis of these samples has been completed

[1]) Le Gall, J.: Statistiques biologiques et Considérations sur la population harenguière de la Manche Orientale et du Sud de la Mer du Nord (Matériel recueilli en 1931). — Revue Travaux Office des Pêches. T. V., Fasc. 3. No. 19. 1932.

[2]) Lissner, H.: Der Deutsche Trawlheringsfang im Jahr 1931. — Der Fischerbote XXIV. H. 5. Mai 1932.

[3]) Wendt, R.: Die deutsche Grosse Heringsfischerei mit Treibnetzen im Jahre 1931. — Der Fischerbote XXIV, Heft 3, März 1932.

ble I.

		Length										
	cm.	20	21	22	23	24	35	26	27	28	29	
bf the Somme	%	0.2	1.5	4.6	11.9	*28.4*	25.1	19.8	6.6	1.7	—	drift-net
of the Somme.....	%	0.2	6.5	14.5	19.5	*26.3*	19.3	9.1	4.4	—	—	drift-net
dettie—Dyck.....	%	1.9	9.3	10.3	12.6	*18.5*	16.3	16.3	10.8	3.4	0.5	trawl

Mode: 24

	Age								
Years	3	4	5	6	7	8	9	10	11
r-group.....	1929	1928	1927	1926	1925	1924	1923	1922	1921
eral average .... %	*19.9*	15.5	*31.0*	15.5	8.9	5.8	1.9	1.1	0.2
parison with average last 6 years	+	—	+	—	—	+	—		

save for the race investigations. In the Northern North Sea at the beginning of the season the younger fish, the 4-year old of the year-group 1928, were dominant to a remarkable extent. As the season advanced the dominance went over gradually to the 5-year old of the year-group 1927, which were most numerous as early as 1931. The 5-year old herring were on the whole dominant in the north, though the 4-year olds were not far behind them in numbers.

The above-mentioned spring race of rapid growth was in 1932 in much smaller numbers than in the previous year, the Fladen ground shoals consisting this time mainly of autumn herring.

Quite a different age-grouping was found in the Southern North Sea, on the edge of the Dogger, though here also just as on the Fladen it was observed, that older herring became more numerous as the season advanced. Thus in the beginning the 3-year old fish of the group 1929 were predominant, later the 5-year old, once also the 4-year old. On the whole the 3-year old herring dominated on the edge of the Dogger.

The course of the German deep-sea herring fishery in 1931 and 1932 has been worked out and charted as in previous years, but the results cannot yet be published.

On the part of the Dutch Institute for fishery investigations numerous herring samples were analysed and age-determinations made from the scales. The material was collected from October to December near Smiths Knoll and at other places in the Flemish Bight.

2. Rate of Growth.

At Lowestoft growth calculations on the first zone of the scales have been continued this year. In 1931, the four-year old fish at Grimsby and on the Dogger Bank were used for this calculation, and this year, the five-year old fish have been used, the area of observation being extended to East Anglia and the French coast. This work is in connection with the recommendations of the subcommittee of the International Council which met at Lowestoft in November 1930.

The Belgian work chiefly concerns spent herring, the annual concentration along the Belgian and French coast being investigated actively during the two last seasons 1931—32 and 1932—33. The method was that adopted in 1930—31: Daily samples of 30 herrings, obtained from landings at Ostend from well determined places in the coastal zone, were submitted to careful analysis, on the usual lines: length, weight, age-group, sex, state of gonads, quantity of fat, content of stomach, number of vertebrae. Efforts were made to discover the grounds where they had been breeding just before coming to the coast as spent herrings and to ascertain the group they belong to i. e. Channel herring or Southern North Sea herring. Two memoirs are nearly ready for printing, one on the season of 1931—32 and the other one on 1932—33. It was intended to follow the fishing closely this year with a special ship for checking information by fishermen, as well as for pointing out to them the shiftin of the maxima concentrations as they occurred, ar so helping their fishery. Unfortunately the "Victoire could not be made ready for work in time to follo the spent herrings after they have left the coast, ar so to ascertain whether they then disperse or kee on travelling in shoals towards feeding grounds st entirely unknown. Many other points still requi more solid data before we can draw a complete pictu of the life cycle and discover the causes of the mov ments of the very interesting community whi presents itself so conveniently for study each year the close vicinity of the Belgian and French sho

3. Young Herring.

The study of the young herring was continued th year in the Wash, the motor drifter "Onaway" bei used for this purpose.

In the southeastern part of the North Sea — as the previous year — the quantity and the length the young herring taken in the catches of the cover cod-end of the "Poseidon" were determined (15. IV 2. V). The quantity was very much less than in M 1931 in the same area. The lengths this time we somewhat greater, the most frequent being 10—12 c At the same time the larval and postlarval herrin were remarkably scarce (see 4). The samples of he ring taken at sea by the Heligoland biologists we placed at the disposal of the Hamburg Fisher biological Department for racial investigations.

In the year 1931 the Hamburg Department beg the collection of material of the so-called Elbherri (fish of the I and II groups) and this has been co tinued from Cuxhaven. This study appears full promise not only in connection with the question race-composition, but also for the early detection the appearance of good or bad year-groups. In t way possibly a further means of making foreca may be gained.

4. Larval Herring. Location of Spawning Plac

In the neighbourhood of Heligoland and in t mouths of the Elbe-Weser-Jade observations w continued on the occurrence, distribution and leng of the herring larvae during the months Decem 1931 to April 1932. In the period from April 15 May 2 these observations could be extended with t "Poseidon" to the outer parts of the German Bi and adjacent areas.

As is known, the larvae hatched in October a November in the area of the western Dog generally appear at Heligoland in January a February. This has again been the case this ye apparently to the same extent as usual. The lar coming from the Flemish Bight and also the Engl Channel usually arrive in the German Bight ab the middle to the end of March. They re-inforce t the older stock from the Dogger Bank, as a rule qu appreciably, and as newcommers are distinguisha by their greater numbers and smaller body-leng In the spring of 1932, however, only a small inf

f Channel herring was evident, at least its arrival as not remarked at Heligoland in contrast to ie earlier years of investigation, especially 1928—930. In agreement with this very few herring fry ere observed on the "Poseidon" cruise (15. IV—2. V) the German Bight outside the mouths of the rivers. The small influx of Channel larvae is possibly con-ected with the weak inflow of Channel water into ie North Sea in the first months of the year, as etermined by the English hydrographers. In its place ie influence of north-western and northern water as very marked this spring in the south-eastern arts of the North Sea. On the "Poseidon" cruise in pril this was seen especially in the composition of ie plankton, most marked in the area off the North riesian Islands and off Graa Dyb and Ringkjøbing. Iere the plankton had a distinctly northern cha-acter such as had never before been noted on the umerous spring cruises of earlier years. Plankton ecies of undoubtedly northern origin, such as *Tha-ssiothrix longissima* and *Oikopleura labradoriensis* hich had not been recorded hitherto in the German ight, had penetrated as far as 20 miles off Amrum nd 15 miles off Sylt, and they were numerous in e northern part of the German Bight and north of orns Reef.

On the cruise of the fisheries patrol vessel "Weser" 5. XI—14. XII. 1932) only vertical hauls could be ade, as the vessel was not furnished with the appa-tus necessary for the working of the larger hori-ntal nets (e. g. young-fish trawl). In place of the ensen egg-net, however, a larger vertical apparatus as used, the "larva net" (silk No. 0), with four nes the catching power of the other. The observa-n area extended in the Southern North Sea from rkum and the West Friesian Islands as far as the m. line. In the Flemish Bight the northern and stern part was searched for herring larvae; the rk planned for more southern waters and in the annel had unfortunately to be given up owing to e bad weather.

The result of the 3 sections examined in the Bight aaks lightship—Yarmouth, Ymuiden—Corton light-p, Sunk—Corton) agreed with earlier observations, ough on the "Poseidon" cruise of 1928 the number larvae was greater for the same day and place. the period in question (end of November and begin-g of December) only the western part of the Bight, ween the western edge of the Deep Water Channel d the English coast, was populated by herring larvae, d this only sparsely (up to at most 15 per m^2). o length groups were present (10 and 20 mm. des) both of which had come down with the East gland current from N.W. — as the character of plankton also showed. Larvae from the Dover aits and the Channel had not yet reached the thern part of the Bight. — Some forerunners of larvae hatched out on the south-west part of the gger and moving south-eastwards were first taken the middle of November on the 40 m. line of the ster Bank.

Regarding the Scottish observations in the northern part of our area the following has been reported. During the cruise in May no herring larvae of spring origin were secured south of Berwick though a few were caught between Berwick and the Firth of Forth. Negative results were obtained at all the offshore stations. Transition stages of the previous autumn brood were not obtained outside the Firth of Forth. In October, observations were made south of the line Berwick—Lindesnaes during the first half of the month and between the Firth of Forth and the Great Fisher Bank during the latter half. Larvae chiefly from 11 to 20 mm. in length were taken in large numbers off Berwick but very sparingly off the Northumberland coast. A large wave of hatching was observed on the Ground Edge of the Dogger, while a few larvae just after hatching were caught in the region of the Lower Edge. There appeared to be a break between the Gut and the Dogger Bank as no larvae were taken in any of the hauls in this region or farther east towards the Outer Rough. A few larger larvae from 16—20 mm. in length were caught on the western edge of the Dogger.

Larvae, chiefly from 11 to 20 mm. in length, were taken in large numbers between the Firth of Forth and the Gut, but their frequency diminished rapidly in an easterly direction and only a single larva ca. 26 mm. in length was caught east of the Gut in the neighbourhood of the Great Fisher Bank.

5. Herring Races.

At Lowestoft the study of the distribution of herrings of different vertebral composition has been continued and fish from the following areas have been examined:— Grimsby, Lowestoft and the north French coast. This work is carried out in conjunction with the study of the size of the first growth zone on the scales and will be reported on as soon as the results are ready. The observations have been confined to the five-year old fish, to make the work continuous with that done in 1931 on the 4-year old herrings (see also B. I. 1).

The French results of the fishing season 1932—1933 confirmed the earlier. The vertebrae average for the herring of group II (south of the Somme) has this year still agreed distinctly with the "Channel type" average determined in the year 1927.

Group II. Average 56.72; s. d. $\pm$ 0.605; e. M. $\pm$ 0.101.

The group I and the Dyck-Sandettie group have been composed in 1932—1933 of a mixture of both populations (from the Channel and from the Southern North Sea), and the mixing of the two populations through the Calais Straits showed itself in both directions. The averages for the vertebrae were:

Group I:
Average 56.60 with s. d. $\pm$ 0.640 and e. M. $\pm$ 0.10
Group Dyck:
Average 56.64 with s. d. $\pm$ 0.650 and e. M. $\pm$ 0.08

The material for race investigations collected by the Hamburg Department in 1931 was worked up in the year 1932 from new points of view. The material concerned came chiefly from the Northern North Sea (vide report Northern North Sea 1932).

In Holland the racial composition of material from the Flemish Bight (Hoofden) in October to December was investigated, especially from the neighbourhood of Smiths Knoll.

6. Food of Herring.

See B. I. 4.

IV. Plaice.

1. General.

During the year under report a series of important publications dealing with the North Sea plaice has appeared (1—11). These include on the one hand reports summarising on results obtained in recent years (1—7) on the other lectures given at the scientific meeting in Copenhagen on June 24, 1932 (see Vol. LXXX of the Rapports et Procès-Verbaux) dealing with the question of the damage done to the marketable stock by the removal of undersized fish (8—11).

Of the publications in the first category the two papers dealing with the catch of young flatfish in the shallow coastal waters (1 and 2) have already been considered in the section on Littoral Fishing (see B. I. 2).

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1. Gilson, G.: See p. 34 (footnote).
2. Wulff, A. und Bückmann, A.: See p. 35 (foodnote).
3. Thursby-Pelham, D. E.: Report on the English Plaice Investigations during the years 1926—1930. Ministry of Agriculture and Fisheries. Fishery Investigations, Series II, Vol. XII, No. 5, H. M. S. O. 1932.
4. Thursby-Pelham, D. E.: The present Position of Steam Trawler Plaice Fishery at Lowestoft. Fishing News, 26—27; 25. VI. 1932.
5. Jensen, Aage J. C.: Rødspættefiskeriet i Nordsøen. Dansk Fiskeritidende, Nr. 37. 1932.
6. Lundbeck, J.: Untersuchungen über die deutschen Schollenanlandungen aus der Nordsee, insbesondere über die Anlandungen der Hochseekutter in den Jahren 1930 und 1931. — Ber. d. D. W. K., N. F., VI, 3. 1932.
7. Bückmann, A.: Ergebnisse der Kontrolle der Schollenbevölkerung der Deutschen Bucht bis zum Jahre 1932. — Ber. d. D. W. K., N. F., VI, 3. 1932.
8. Jensen, Aage J. C.: The Effect of the Plaice Fishery on the Stock of undersized Plaice and its Influence on the Yield of the Plaice Fishery in the North Sea. — Rapp. Proc.-Verb. LXXX. 1932.
9. Gilson, G.: Destruction of Young Fish on the Continental Coast. — Ibidem.
10. Bückmann, A.: Die Frage nach der Zweckmässigkeit des Schutzes untermassiger Fische und die Voraussetzungen für ihre Beantwortung. — Ibidem.
11. Russell, E. S.: Is the Destruction of Undersized Fish by Trawling prejudicial to the Stock? — Ibidem.

The report on the English investigations in th year 1926—1930 (3) displays a very unfavourabl development of the English plaice fishery. Th intensity of the total English fishery in the North Sea measured in terms of fishing hours, has continuall decreased since 1926. So far as the steamers are con cerned, however, the falling off in the duration c the fishing is to some extent counterbalanced by th use of the more efficient V.-D. trawl since about 1928 Thus, the plaice landings of the steamers in 1927—193 were higher than in the previous years; yet the tota landings have a tendency to fall. The average catc per 100 hours was greater for steamers in 1926—193 than in 1922—1925. This is to be attributed in pa to the influence of the rich plaice groups 1920—192 in part to the greater catching power of the V.-D trawl. The market measurements, however, sho that the quantities of small plaice of little valu have increased relatively in the landings, whilst th larger and more valuable have decreased, though this not apparent in the relative quantities shown in th trade categories. In agreement with this, the age determinations showed that the fishery was base on very young age-groups after the rich groups o 1920—1922 had been fished out. In 1930 the plaic for the most part were younger than 5 years, and th greatest quantity came from the III and IV group The size composition of the stock according to measur ments made on board trawlers had improved on th 1924—1925 composition, and since 1926 shows litt change. — The report contains a critical analys of the growth-determinations according to the averag length of the age-groups and comes to the resul that the determinations by this method are n reliable.

It may be remarked, that the changes which hav occurred in recent years in the plaice fishery of th North Sea have undoubtedly had an unfavourab influence on the English fishery. The enormous increased Danish cutter fishery in the eastern Nort Sea has diminished the increment of growing plai which would otherwise move out to the centr grounds fished by the English steamers. Further, th intensive coastal fisheries, which cater specially f the fish-meal factories, have, apparently, a d leterious influence on the stock in the south-easte part of the North Sea, where the English sailin fishery is carried on.

The later English investigations for the year 19 and first quarter of 1932 (4) confirmed once more deterioration of the landings in regard to size a composition.

Connected with this we have from the Dani side (5) the reasons why the Danish plaice fishe in contrast to the English does not show any declin On the nursery grounds of the eastern North Sea th young plaice are at present protected, as the steam trawler fishing there is no longer of any importanc it is now mainly a plaice-seine fishery. A richer sto of the young is thus present, which — according the strength of the year-group — yields a sufficie

-growth for the marketable plaice. On the other nd, however, the fishery in the south-eastern rt of the North Sea is so intensive, that not many aice are allowed to migrate out into the central orth Sea; consequently, the fundamental conditions r the English fishery there are unfavourable. Apart om all that, the present composition of the stock somewhat unfavourable owing to the fluctuations, ich have largely caused the general decline of the hery in the year 1931.

Of the two German publications mentioned (6 and 7) e former deals with the statistics of the German aice fishery in the North Sea and the yearly course the cutter fishery which is responsible for the chief antities landed; also the size-composition of the arket categories along with the extent and com-sition of the landings in recent years compared th pre-war years. The age-composition has been ecially studied in the landings of the years 1930 d 1931.

The other publication (7) treats the results of e scientific hauls by research vessels and reports the aims and general methods of the investigations. ing the average catch per time-unit an endeavour made to make a numerical comparison of the ength or magnitude of the separate year-groups d of the whole population. Further, the rate of owth — as determined by the average length of e age-groups — and its influence on the fate of the ar-groups and on the product of the fishery are also cussed and here specially useful results have been tained from the systematic collections of material ich have been made from the German side. By mparison with the results of the market measure-nts an attempt has been made to determine the luence of the prevailing composition of the stock the produce of the German plaice fishery. Thanks the systematic co-operation of the investigators on market and on the research vessels an account ld be given of the development of the stock and fishery in the North Sea since the war and their tual influence on the other.

The results of these new reports have naturally n used to a great extent for the lectures, men-ned in footnote under 8—11, which were given at scientific meeting on June 24, 1932. The manifold oretical considerations discussed there by the ex-ts led to the unanimous conclusion, that certainly harmfulness of the destruction of young plaice in earliest years of life cannot be taken for granted, hat the destruction of the larger, undersized ce is undoubtedly harmful, in that it adversely affects the productivity of the stock. This applies all the more, the nearer the fish approach the marketable size. This conclusion is confirmed by experience of the results which have followed on the change of the mode of fishing in the plaice stock of the Southern North Sea. The change from the steamer fishery with trawl to the cutter fishery with seine has led here to a diminution in the destruction of the older undersized fish and this again has led to an increase in the quantities taken. A deliberate thinning out of the stock by destruction of undersized plaice, as recommended a few years ago from various sides, finds no sort of justification in the results of the investigations. On the other hand, transplantation of material from the densely populated young-plaice grounds to the more thinly populated grounds should be undertaken.

2. Statistics and Ichthyometrics.

In Esbjerg the measurement of plaice on the market was carried on from July 4 to July 12 (4,006 plaice measured and 370 measured and otoliths examined) and also from December 8 to December 20 (6,682 plaice measured); — also in connection with the transplantation of plaice to the Belt Sea and Sound, these plaice being taken with the Danish seine in the area south of Horns Reef (2,962 of these were measured, and 652 measured and otoliths examined).

The number of plaice measurements made in England and in Germany, at sea and on the market, can be seen from Section B. I. 1.

In Ymuiden regular market measurements have also been undertaken in this year.

3. Age-determination. Quantity of the Year-classes.

According to the catches of the "Dana" in the Horns Reef area (beginning of May) the year-group 1928 proved to be very rich. South of Horns Reef outside the 10 m. line it contributed 70 % of the catch. The year-group 1929 must here apparently be called moderate or a little below the average, instead of poor as given earlier. The 1930 and 1931 year-groups are poor. North of Horns Reef the year-group 1927 was more strongly represented than to the south (compared with the year-group 1928).

In the July market investigations in Esbjerg about half the plaice landed belonged to the year-group 1928, the majority of the remainder to the 1927 group.

The plaice of 14—26 cm. in length, whose otoliths were examined on the occasion of the transplantation experiments and which came from 5—10 m. off

ble II. Number of plaice in hauls of 30 minutes with the eel-seine in the Nissum Bredning

(Year-group in brackets.)

Age-group	0	I	II	III	IV	V	VI
e 1931	..	82 (30)	148 (29)	694 (28)	38 (27)	2 (26)	0 (25)
y 1932	..	9 (31)	165 (30)	127 (29)	208 (28)	3 (27)	1 (26)
t. 1931	2	119 (30)	96 (29)	269 (28)	5 (27)	2 (26)	
g. 1932	29	62 (31)	81 (30)	38 (29)	24 (28)	1 (27)	

Barren and Skallingen, had the following percentage distribution of the age-groups:

II	III	IV	V	VI	?
0.5	16.4	76.1	6.4	0.3	0.3

Thus, the year-group 1928 contributed $^3/_4$ths of these plaice, the year-group 1929 about $^1/_6$th.

The fishing experiments in Nissum Bredning gave the following results, compared with those for 1931. (See Table II). It is apparent from this table, that the year-group 1928 was the most abundant in the May experiments and much more strongly represented than the 1927 and 1929 groups. For this area it would appear, that the year-group 1930 is of about the same strength as the 1929 group and the 1931 group poorer than that of 1930.

A paper on the fluctuations of stocks of fish is in process of publication[1]).

The collection of otoliths of each trade category of plaice was continued at Lowestoft and Grimsby. The following number of fish were measured, weighed and otolithed. (See Table III).

Since the 1931 material was not completed in time for the Procès-Verbaux last year, the percentage numbers of each age-group for both 1931 and 1932 are given on the next page. (See Table IV).

It will be seen that a considerable measure of agreement is evident between the landings at the two ports. In both 1931 and 1932, the 1927 and 1928 year classes produced the bulk of the landings, the 1928 year class gradually surpassing the 1927 year class as the fish grew larger until in 1932 they made up the greater part of the stock as the IV group. This is evidently an outstandingly strong brood year comparable to the 1922 year class. As far as can be seen from our observations the 1929 and 1930 year classes will contribute but little to the fishery, which will thus be dependent mainly on the 1928 year class for the next two years at least. The majority of the fish of th age-group have fallen into the categories "dead small at Lowestoft and "Chats" at Grimsby. It is to l hoped that a sufficient number will survive to swe the landings of the better priced categories in tl future.

The extent of the German investigations on tl research vessels was as follows.

Month	Area	No. of age determinatio
February	Hever section	27
April	South-east North Sea, 9 sections from off Ameland to off Ringkjøbing	9,9(
July-Aug.	Heligoland	3,5(
Sept.-Oct.	Heligoland	2,0
October	Hever section	3,3
	Total...	19,1
On fishing cutter (1950) and market (13,800)		15,7
	Total...	34,9(

The results from the research vessel's catches 1932 have already been given in the publication No. of the footnote p. 40. The 1928 year-group st dominates completely, the 1929 group is subnorma whilst the 1930 and 1931 groups are distinctly poo The market investigations in 1932, on which a repo will soon appear, gave results in agreement with tl above.

On the Dutch cruise of investigation with tl "Nautilus", in May, 18 one-hour hauls with the tra were made on 4 sections (off Ymuiden, Haaks, Te schelling and Ameland). The age-composition of tl plaice showed remarkable peculiarities. Whereas the 1931 investigation the year-group 1928 (II dominated on all sections, this group in the year 19 (now IV) was met with only in the two north-easte sections, on the Terschelling section only on the oute most station but here in great numbers. On the tv Hoofden sections (Flemish Bight) the 1928 grou

[1]) Jensen, Aage J. C.: Periodic Fluctuations in the size of various stocks of fish and their causes. — Medd. f. Komm. f. Danmarks Fiskeri- og Havundersøgelser. Ser. Fiskeri. IX, 5. 1933.

Table III.

Lowestoft

1932	Dead small	Small	Best Small	Small Medium	Best Medium	Large Best	Tot
April	993	494	217	74	55	42	1,8
July	844	520	315	271	179	43	2,1
October	874	438	284	287	99	31	2,0
December	351	414	380	547	158	31	1,8
Total...	3,062	1,866	1,196	1,179	491	147	7,9

Grimsby

1932	Chats	Small	Best Small	Middles	Best Medium	Large Best	Large	To
March	572	469	415	304	178	143	106	2,1
June	671	711	632	409	189	148	116	2,8
September	563	589	522	326	187	135	87	2,4
December	548	647	390	290	162	127	71	2,2
Total...	2,354	2,416	1,959	1,329	716	553	380	9,7

able IV.

Percentage Number of plaice landed in each Age-Group at Lowestoft and Grimsby in certain months of 1931 and 1932.

Port	Date		Age Groups									
			II	III	IV	V	VI	VII	VIII	IX	X	XI+
Grimsby	Mar. 1931	Year of Birth	(1928)	(1927)	(1926)	(1925)	(1924)	(1923)	(1922)	(1921)	(1920)	(1919-)
		Percentage	9.7	32.0	22.4	12.6	6.5	2.2	6.8	3.6	1.7	2.4
		Year of Birth	(1929)	(1928)	(1927)	(1926)	(1925)	(1924)	(1923)	(1922)	(1921)	(1920-)
Lowestoft	Apr. 1931	Percentage	—	13.9	48.2	21.9	11.6	1.4	1.8	0.7	0.3	0.1
Grimsby	June 1931	—	0.4	38.0	31.0	8.7	6.4	2.8	1.3	4.8	2.4	4.4
Lowestoft	July 1931	—	0.7	47.6	32.0	12.5	5.0	0.8	0.2	0.7	0.3	0.2
Grimsby	Sep. 1931	—	1.6	38.1	22.0	9.5	9.2	4.8	2.3	6.5	2.6	3.3
Lowestoft	Oct. 1931	—	9.4	49.4	32.0	6.1	1.5	0.5	0.3	0.4	0.2	0.2
Grimsby	Dec. 1931	—	4.2	44.8	21.2	6.1	6.2	4.1	3.4	4.2	2.8	3.1
Lowestoft	Dec. 1931	—	2.0	46.8	21.7	8.9	7.7	3.4	3.5	3.3	1.2	1.5
Grimsby	Mar. 1932	—	1.9	39.3	24.1	9.3	5.8	4.0	1.9	5.0	3.4	5.3
		Year of Birth	(1930)	(1929)	(1928)	(1927)	(1926)	(1925)	(1924)	(1923)	(1922)	(1921-)
Lowestoft	Apr. 1932	Percentage	0.4	7.1	66.7	19.1	3.4	1.9	0.5	0.2	0.4	0.2
Grimsby	June 1932	—	—	1.1	54.5	26.9	6.3	4.3	2.0	0.6	1.7	2.6
Lowestoft	July 1932	—	2.6	15.3	65.6	12.5	1.5	1.0	0.2	0.1	0.5	0.6
Grimsby	Sep. 1932	—	1.1	11.5	58.7	10.5	3.3	3.8	2.5	1.0	4.0	3.5
Lowestoft	Oct. 1932	—	2.9	14.1	70.7	8.1	1.5	1.2	0.3	0.2	0.6	0.4
Grimsby	Dec. 1932	—	2.6	10.9	45.3	13.7	7.3	6.6	3.6	1.3	4.2	4.5
Lowestoft	Dec. 1932	—	4.6	15.6	60.4	11.2	2.7	1.8	0.8	0.4	0.9	1.5

e V.

age Increase in Length (cm.) of Plaice Marked and Liberated off the Danish, German and Dutch Coasts (Number of Fish retaken in Italics).

f Date of Libera- tion	Position of Liberation	Months after Liberation												
		1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th	13th	14th
May		*106*	*47*	*26*	*65*	*5*	*5*	*2*		*4*	*2*		*5*	*1*	*3*
1929	Horns Reef	0.01	0.6	1.7	2.8	3.0	3.2	4.0	Nil	3.1	3.0	Nil	4.5	8.0	9.6
		48	*36*	*18*	*33*	*9*	*4*	*3*	*3*	*9*	*8*	*11*	*21*	*7*	*4*
—	Graa Dyb.....	—0.03	0.4	1.3	2.2	3.0	2.6	2.6	3.2	2.9	2.7	3.6	3.3	3.9	6.0
		29	*44*	*17*	*25*	*13*	*6*	*4*	*1*	*1*	*13*	*11*	*22*	*11*	*8*
—	Near Sylt.....	—0.03	0.5	1.9	2.1	3.4	2.6	3.4	4.0	2.2	4.5	4.3	3.8	4.9	5.2
		28	*50*	*39*	*30*	*26*	*11*	*3*	*2*	*6*	*4*	*6*	*4*	*5*	*5*
—	Schiermonnikoog..	—0.05	0.8	1.7	3.2	4.6	5.3	6.8	4.1	4.3	5.7	5.1	5.8	6.3	8.1
		46	*11*	*7*	*10*	*3*	*3*	*4*	*4*	*6*	*12*	*18*	*15*	*4*	*6*
—	Haaks Light Vessel	—0.0	0.2	0.6	1.2	2.5	3.1	4.0	4.4	3.0	3.7	3.6	4.0	4.7	5.2
May		*18*	*14*	*4*	*6*	*3*		*1*		*3*	*7*	*9*	*10*	*12*	*4*
1930	Haaks Light Vessel	0.06	0.4	0.5	0.8	1.5	Nil	—0.2	Nil	2.7	1.7	1.8	2.2	2.3	1.7
		12	*18*	*18*	*12*	*11*	*8*	*2*	*4*	*1*	*6*	*6*	*10*	*8*	*16*
—	Schiermonnikoog..	0.5	0.9	1.6	1.2	2.5	2.3	1.4	3.2	0.6	1.7	3.4	3.0	2.9	4.5
Nov.		*2*	*1*	*2*	*3*	*8*	*8*	*13*	*10*	*8*	*11*	*7*	*3*		
1930	Schiermonnikoog..	0.3	0.0	—0.3	—0.3	0.3	1.2	1.1	1.7	2.0	2.3	2.6	2.7		
			1	*3*	*3*	*32*	*23*	*17*	*12*	*4*	*3*	*4*	*4*		
—	Haaks Light Vessel	Nil	—0.5	0.3	0.3	0.4	0.9	1.1	1.5	1.5	1.8	1.9	1.0		
May		*112*	*45*	*25*	*18*	*10*	*1*	*2*	*4*	*2*	*6*	*8*	*21*	*15*	*5*
1931	Graa Dyb.....	0.2	0.9	2.1	2.5	2.5	3.0	3.0	3.3	5.4	3.5	3.8	4.5	4.6	4.5
		91	*50*	*14*	*12*	*15*		*7*	*2*		*10*	*20*	*42*	*29*	*13*
—	Sylt	0.4	0.5	2.2	3.5	2.5	Nil	3.3	3.7	Nil	3.7	4.1	4.2	4.1	4.7
		58	*110*	*25*	*15*	*9*	*2*	*4*	*3*	*3*	*3*	*7*	*13*	*18*	*12*
—	Helgoland.....	0.4	0.7	1.4	1.8	2.0	4.3	3.5	2.9	2.8	3.1	2.3	3.4	3.5	5.1

exceeded the 1929 group (III) but not the 1930 group (II), which was the most abundant here. On the other hand again, the 1929 group was more abundant than the 1930 group on the Terschelling and Ameland sections, just as was also found in the German Bight.

4. Rate of Growth.

The Danish determinations in the Horns Reef area on material obtained by ottertrawl gave the following results for the average lengths of the different age-groups.

Group	II	III	IV	V
cms.	13.5	16.2	18.8	23.5

On the whole the lengths are not much below those determined in the years 1927 and 1925. Nevertheless the year-groups 1928 and 1929 are distinguished by their relatively slow growth.

In England, the rate of growth is being studied by means of marking experiments. Calculations for the average increase in length of plaice recaptured in each month are in course of preparation. Such material as is available is given in Table V. No allowance has been made for shrinkage due to drying etc., but plaice which showed a decrease of more than 2 cm. or an increase of more than 3 cm. during the first month after liberation were omitted and also those which showed a decrease of more than 1 cm. in subsequent months.

The difficulties of obtaining a sufficient number of returns are evident from Table V. The most reliable for the purpose of calculating the rate of growth are evidently those of the experiments carried out in May 1931 where over 1000 fish were liberated at each station, a very much greater number than were marked in 1929 and 1930. Even with such large experiments there are many months when the returns are too few to afford satisfactory data.

According to the German investigations the rate of growth was also very small in the year 1932. In April a small percentage of the rich 1928 group had just grown to marketable size. Thus, the 1928 group was still inferior to the poorer 1927 group in the German landings.

In this year a marked decrease has taken place in the catch of the fishery in the German Bight, for which according to the observations on the German fish markets three explanations may be given. 1) In consequence of its slow growth only about 10 % of the rich 1928 group had reached a marketable size (compared with about 50 % of the IV group in the preceding year). 2) The smallest (below 25 cm.) of the normally marketable plaice were this year often left behind by the fishermen, in consequence of the difficulties of sale during the economic crisis. It has been calculated, that about 20 % of the plaice which would have been landed under normal conditions were thrown overboard. 3) The 1929 and 1930 groups have proved to be both numerically weak and unusually slow in growth. Consequently the III group which has hitherto formed a not inconsiderable portion of the landings, was of no importance. In the spring fishery the 5-year old plaice were most abundant; the 4-year old only became more prominent later in the year. Taking the year as a whole, the latter certainly predominated, but the 5-year old were about equal and the older, from the V-group upwards inclusive, contributed more than half of the fish landed, whereas previously they had only yielded a third. The abundance of the 1928 group will probably exert an important influence on the product of the fishery first in 1933.

In the Dutch area of investigation (off Ameland–Ymuiden) the average length of the age-groups was on the whole uniform. For the IV group (1928) it was lower than the figures for 1931, for the III group about the same as in the previous year. The average lengths, however, were essentially higher than those observed in the German Bight. They were:

Age-group	I	II	III	IV
in Dutch observations...	12	16	20	23 cm
- German — ...	9	13	16	19 -

5. Distribution of the Stock.

In the second half of April of this year the plaice were in very shallow water (down to 15 m.) off the North Friesian coast, so that their distribution was the same as in the years 1931 and 1926 ("Poseidon").

In the Dutch investigations of May 1932 the plaice were found to be in rather deeper water than in May 1931, when the largest catches were mostly in the neighbourhood of the coast. In 1932 the largest catches were made on the sections off Ymuiden and Haal in 25 m., on the Terschelling and Ameland sections in about 30 m. The population on the two northeastern sections were considerably richer than on those situated in the Flemish Bight. Yet the catches were never so large as those made by the "Poseidon" in the German Bight at the same period and with apparatus of similar size. The same observation was also made in 1931 already.

6. Investigation of younger stages.

The material collected in the German Wattenmeer in the years 1926 to 1930 on the distribution and abundance of the plaice in the first years of life has been subjected to examination. It has shown, that the distribution of the young plaice in this extensive and variegated area is uneven, to such a degree, that reliable averages of the density of the population cannot be calculated. The method of Johansen, by which the density of the year-groups is determined already in their first year, cannot therefore be used here. Nevertheless precise determinations could be made of the distribution, daily and seasonal migrations and the growth of the small plaice.

7. Marking and transplantation experiments.

At the end of Prof. GILSON's memoir (see B. I. 2) e writer discussed the idea of transplanting the ry young fish caught near the shore out to deeper ater some distance from the coast. This is based on e fact pointed out by the Danish biologists that ansplanted young fish do not swim away at once om the place where they are returned to the sea. change in their conditions of life by transfer from crowded nursery ground to an uncrowded ground fficiently rich in food material may produce a vourable result of an acceleration of growth as well a temporary enriching of the zone in which small gh sea cutters with a motor under 50 HP fish for iddlesized plaice, sole and dab. The Ostend Labora-ry is now carrying out preliminary experiments on e marking and transporting of very young fish, as ell as researches on the special technique for trans-rring fish into floating tanks without hauling the awl out of the water.

The Danish workers undertook marking and trans-antation experiments during the May voyage of e "Dana". 200 fish were marked and released at aa Dyb, while 400 were transplanted to the Dogger nk. 150 fish taken on the Dogger were marked and eased on the spot; 130 on the north-eastern part the Dogger. Up to March 1st 1933, 75 (56 %) had n recaptured. The transplantation will be repeated. Marking experiments were carried out by the westoft Laboratory in May and November 1932. e particulars of these and the previous experiments in process of being worked up. In the meantime is possible to give some provisional results which subject to correction.

May 1931	Number liberated	% returned in 12 months
1. Graa Dyb	1,001	26.2
2. Sylt	1,007	27.1
3. Heligoland	1,006	28.2
4. Borkum	1,004	30.4
5. Haaks L.V	1,004	35.4
31st October 1931		
6. Near Terschelling ...	1,016	17.1
May 1932		
1. Graa Dyb	1,000	13.7
2. Sylt	1,000	13.7
3. Norderney	1,000	15.6
4. Schiermonnikoog	1,000	20.8
5. Haaks L.V.	600	15.0

he number of plaice returned from the 1932 May eriments are very much lower than the numbers ptured in a similar period from the earlier ex-iments.

n November 1932 a thousand plaice were liberated each of the following stations: Graa Dyb, Sylt, derney, Schiermonnikoog and Haaks Lightvessel.

V. Other Fish.

Mackerel. In France the study of this species was carried further with a considerable increase in the number of measurements made on the fishing grounds. Numerous measurements from the Fladen Ground and from the eastern entrance of the Channel led to the detection of several year-groups on the chief fishing places. In the year 1933 this intensive work, which dealt with more than 15,000 fish in 1932, will be continued.

Sole. At Heligoland the age-determinations especially were continued. 732 scale samples were examined. The stock was composed of the year-groups 1929, 1930 and 1931; older groups were represented but sparingly. The 1931 group seemed rich. The catches for the market were mainly composed of the 1929 group and the largest individuals of the 1930 group. Good catches of sole may be expected in the year 1933.

A report has been drawn up on the age-composition and growth of the sole population.

Sprat. At the Ostend Laboratory continuous observations have been made during the sprat seasons of 1930—31, 1931—32, 1932—33. Daily samples of 1 kg. were analysed according to the herring method. Special attention was paid to the percentage of young herrings mixed up with the sprats and to the variation of that percentage during the whole course of the season.

During 1932 (which includes the latter half of the 1931/32 sprat fishing season and the beginning of the 1932/33 season) routine examinations have been made of samples taken by commercial vessels on the Suffolk, Essex and Kent coasts. The M.V. "Onaway" has supplemented these samples. It seems that the composition of the sprat shoals in the autumn of 1932 resembled that of the preceding season (1931/32) in containing a higher proportion of large, 2 to $2^1/_2$ year old fish than was found in 1929/30 or 1930/31.

From March onwards Whitebait samples were once more obtained from the Thames Estuary, after having been very scarce throughout the winter and preceding autumn. At first the whitebait contained only fairly large sprats comparable to those normally found in the adult shoals at Brightlingsea, but in May an infiltration of smaller yearling sprats was apparent, It was a remarkable fact that many of these sprats, although only 7—8 cm. in length, showed evident signs of sexual maturity.

Some fat determinations have been carried out during the current season (1932/33) and it appears that the fat falls rapidly from a value of 10 % or more before Christmas to a value in the neighbourhood of 5—7 % in the New Year. The stomach contents have also been examined regularly and demonstrate that (for this season at least) the sprats have fasted consistently during their winter inshore migration.

On the cruises of the Heligoland Institute in the German Bight investigations have recently been undertaken on the quantity and length of the sprat

captured in the covered cod-end along with the young herring.

Tunny (*Thunnus thynnus*). The continued study of the biology of this species in Boulogne is carried on in collaboration with the International Commission for the study of the Mediterranean. Hydrographical observations are made on the fishing grounds.

Gurnards. A publication has appeared dealing with the species occurring on the French coasts[1]).

VI. Shellfish.

Periwinkle. The English investigations have been mentioned above (B. I. 2). The publication noted below has appeared from the French side[2]).

Pecten maximus. The observations on the French coast in the eastern part of the Channel have not yielded any new results. The marking experiments made last spring have been fruitless.

Oyster. In England the experiments on the rearing of larvae were continued in Conway and Lympstone. Spat was obtained in these experiments, but the adequate nourishment of the larvae still presents difficulties. The young oysters obtained in the 1929 experiments reached marketable size already in 1932.

In a renewed investigation of the German oyster banks on the North Friesian coast it has been found, that the stock on the banks not used for culture has steadily decreased further since 1925. From the Danish side a similar phenomenon has been found in the Limfjord[1]). On the North Friesian banks only a fe isolated, very old oysters remain, the productivit of which is not sufficient to populate the area agai For this reason extensive cultural work with ne populations of Dutch seed oysters has been propose A report on the subject will appear shortly (Wis Meeresunters.).

The experiments on the artificial rearing of oyst larvae in small tanks were continued in Heligolan Further progress has been made, but not sufficie to justify its recommendation as a practical metho — The results of the close study of the anaton of the oyster larvae are to be published short (Wiss. Meeresunters.).

A conference of the shellfish experts called togeth by the International Council was held in Hollar (Middelburg, Sept. 20—22).

Lobster. In Heligoland the retention in captivi of female lobsters with ripe eggs until the larv hatched out, which was referred to in the previo report (p. 206), has led to the development of practical industry. In 1932 600 egg-bearing femal were sent in by the fishermen. These were kept floating wooden boxes, anchored at sheltered spot until the larvae hatched out and then returned the fishermen to be sold. In this way the greater pa of the progeny which would otherwise have been lo was saved. The loss of mother-lobsters amounted only 15 in 600 (2.5 %).

A report is in course of preparation on physiologic observations on the moulting and on the growth the lobster up to the 20th moult.

C. BENTHOS AND DEPOSITS

Work was carried on with the Petersen grab during the cruise of the "Dana" in the North Sea (April—June).

The results of the investigations regularly undertaken by the Heligoland Biologische Anstalt in the years 1925—1931 on the census area ("Bonitierungsgebiet") off Norderney—Borkum are still in process of elaboration.

In order to obtain a broader view of the changes in the stock of the bottom-fauna, 6 fixed stations have been selected in the German Bight for the German investigation cruises: 2 on the East Friesian coast, 1 off the mouth of the Elbe, 1 off the Hever mouth, 1 at Amrum Bank and 1 off Lister Deep. In addition some stations in the neighbourhood of Helig land. At each station at every opportunity th occurs a "sample section" is made with at least grab samples taken close together.

In addition, as before, samples are taken at eve trawl and plankton station of the "Poseidon". Th year, from 16. IV—2. V, 176 bottom samples fro 170 stations (including 61 from the "sample sections have been investigated.

Striking phenomena have not been observed this year, apart from a copious occurrence in spri near Heligoland of *Corbula gibba*, a Mollusc of impo ance as food for the plaice.

A report will appear shortly on the investigatio carried out at the branch laboratory of the Biologisc Anstalt in List on Sylt regarding the shore fau and flora in the coastal waters (Wiss. Meeresunters

[1]) Priol, E.: Remarques sur les espèces de Grondins les plus communes des côtes de France. — Revue Travaux Office Pêches. T. V. Fasc. 2. No. 18. 1932.

[2]) Dollfus, R. Ph.: Sur l'attaque des Bigorneaux: *Littorina littorea* L. de Hollande par Polydora. — Rev. Trav. Off. Pêches. T. V. Fasc. 2. No. 18. 1932.

[1]) Spärck, H.: Studies on the biology of the Oyster the Limfjord IX. — Rep. Danish Biol. Stat. XXXV pp. 59—64. 1932.

D. PLANKTON

The Lowestoft Laboratory carried out four plankton ises during the year: in May, June and October. e May cruise was intended to cover a wide area northern North Sea, but more especially the region the Great Fisher Bank and the Viking Bank, from ich liners were collecting herring stomachs for the istry. Owing to rough weather only two lines of tions were worked between the Northumberland st and the Naze of Norway.

n June and the first half of October, voyages were de with a view to charting the ether-soluble matter tent of dried zooplankton samples from the area the English east coast. In June it was found that area in which the "fat" content was greatest ncided with the area being fished by the herring fters working from North Shields. This corroborated extensive work of the same nature carried out 1926. The October values were in no case as high those earlier in the year, and again the highest ues were in the northern part of the area. The er-soluble matter values were, however, relatively her in the southern part of the area than they been in June. On the October cruise the diatom *zosolenia styliformis* was found in exceptionally e numbers at 53°45′ N. Lat.; 1°50′ E. Long.

he cruise made during the second half of October for the purpose of locating concentrations of *eocystis* or diatoms in positions likely to affect shoaling of herring. No *Phaeocystis* was found, a very dense patch of *Rhizosolenia* was found ween 53° and 54° N. Lat., and 4° and 5° E. Long. centre of this mass was about 100 miles east of one found on the previous cruise two weeks earlier. ith the exception of August, Hensen net hauls e taken at six stations, 12 miles apart, between nborough Head and the south-west patch of the ger Bank, from June until the end of the year. proposed to make this a monthly routine ob- ation over a number of years, in order to measure nnual and periodic incursions of important zoo- kton forms, particularly *Calanus finmarchicus*.

erring Food Investigations were continued as revious years. The stomachs of 7,951 herring were cted and the contents examined; of these 2,442 from liners working in the neighbourhood of the Great Fisher Bank and 5,509 were from the feeding grounds off Shields. The collections covered the period April 2 to September 23.

During June the motor vessel "Onaway" was working among the drifters off the Northumberland coast, and a Hardy plankton indicator was towed before the drift-nets were shot and after they were hauled. The catches of plankton revealed the presence of large numbers of Echinoplutei which gave the discs a brick-red colour. *Calanus* and other copepods were exceptionally few in number.

In Boulogne a rich material of plankton samples has been collected, in connection with the daily hydrographical observations on the "Sandettie" lightship.

In Heligoland the further investigations carried out at the instigation of the Plankton Committee on the catching power of different types of vertical nets, have been brought to a conclusion and the report has been published[1]). A report has also been written on a *Bougainvillia* species, which has probably been carried into the Southern North Sea by trading vessels[2]).

On the spring cruise of the "Poseidon" (15. IV—2. V) the observations described in the preceding report on the occurrence of *Phaeocystis globosa* have been repeated. The area of distribution again lay off the East Friesian Islands, but the numerical abundance in this year (second half of April) was considerably less than in 1931 (first half of May). Regarding the extensive incursion of northern plankton species (*Thalassiotrix longissima* and *Oikopleura labradoriensis*), which otherwise have not been found in the German Bight, a report has been made above (see B. III. 4). Further, to the south of Horns Reef *Phaeocystis Poucheti* and *Limacina retroversa*, likewise of northern or north-western origin were observed. It may also be noted, that *Oikopleura labradoriensis* was observed at Heligoland for the first time on April 4, 1932. — Plankton investigations were also made on the cruise of the "Weser" in November and December. The material was examined chiefly for the characteristic forms of the different current areas of the Southern North Sea and Flemish Bight.

At Heligoland experiments with oblique hauls of the young-fish trawl were made.

E. HYDROGRAPHY

lgium. Daily observations are made on the vessel "West Hinder", and samples of water for t, and of plankton are taken weekly. The system eekly crossings of the sea between Deal and elines has suffered some interruption and needs ganisation; the Belgian navy having at disposal ishery surveying ship only, cannot promise any r to ensure the continuation of special weekly ges.

nmark. Hydrographical observations were car- out on the May cruise of the "Dana" in connection with the biological investigations at 47 stations. The material collected consists of determinations of temperature, salinity, phosphate and nitrate content at different depths, and will be published in

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[1]) Künne, Cl.: Weitere Untersuchungen zum Vergleich der Fangfähigkeit verschiedener Modelle von vertikal fischenden Plankton-Netzen. — Rapp. et Proc.-Verb. Vol. LXXXIII. 1933

[2]) Künne, Cl.: Zur Kenntnis der Anthomeduse *Bougainvillia macloviana* Lesson. — Zool. Anzeiger, Bd. 101. 1933.

the Bulletin Hydrographique. Regarding the results of the phosphate and nitrate investigations attention is called to the appendix by Helge Thomsen, M.A. (See Part III page 42).

England. Once again Drift-Indicator work has been in train throughout the entire year from the two English lightships Varne and Cromer Knoll. The second report on the results obtained at the former key position is now almost ready for publication; it deals with the data up to the end of 1932, and in it are displayed certain applications of them to fishery research problems. The unbroken series of records stretching over more than six years have been, as hitherto, worked up into a form enabling one to know the mean current representative of individual months, seasons etc. Throughout the whole year save January, liberations of drift-bottles have been made several times each month at a position in mid-Channel on the meridian of 1° W. — as a complement to the Varne current measurement work, and sundry other experiments with special types of drift-bottles have been made at various positions in the Channel still further to amplify knowledge concerning the water transport therefrom to the North Sea.

From the lightvessels Cromer Knoll, Smiths Knoll and Galloper, weekly liberations of drift-bottles have been made since February, and the results being amassed are to be worked up in a manner which, it is hoped, will provide a critical test of the validity of certain modern inferences from drift-bottle travels. In October a special experiment with drift-bottles in the South-west Dogger Bank Swirl area was undertaken.

Progress with the preparation of the report on the water flow past the Cromer Knoll lightship has been made.

As commenced last year, the calculation of monthly residual winds at the Varne and Cromer Knoll lightvessel positions, has been continued.

The year as a whole has been markedly different in point of Varne current from the four years 1927—1930. These four years were characterised by a bold sweep of water heading straight through the middle of the Straits towards the North Sea. In 1931 there was much less easting in the representative average constant current (N. 18° E. vice N. ca. 30° E.), whilst in 1932 the representative flow for the entire year works out as having been directed toward N. 6° E. — that is, towards a direction two points *contra solem* from the trend of the Narrows. Whether it is to be assumed that there was almost always, as a result of the persistent urge of waters on to the Kent coast, an escape stream up the east coast of that county in the absence of a direct flow issuing from the middle of the Straits, cannot yet be decided.

The year 1931 seems clearly to have been in the nature of a transition year. The grand vector average for 1932 of 3.5 miles a day towards N. 6° E. reflects the occurrence of many reversals. Not since summer 1931 has there been a season throughout the whole of which there was a dominant stream heading as far east as N. 20° E. The winter of 1931/32 was season of dominant reversal; the spring of 1932 a the summer of the same year were seasons with very indifferent flow towards the North Sea, a autumn 1932, albeit a season of strong curren "works out as" a more normal season only becau October was a month of strong issuing flow towar N. 22° E. Actually the other two months concern (September and November) were months of ind ferent flow.

January and October were months of strong norm flow; February was a month of very pronounc reversal (residual wind 11.5 miles per day fr N. 35° E. true); April, July and December we months of strong currents with an amount of easti (about N. 13° E. on the average) less than "norma — whilst the remaining months (March, May, Jun August, September and November) were mont characterised by little enough flow to rank as mont of "hold-up" or reversal — especially June, when t average constant current was directed towar N. 25° W. true. During the latter months winds fr the N.E. quadrant held sway. In 1932 there we five months in which the wind was dominantly fr quadrants other than the S.W.

In many cases of reversal of current through Do Straits during the year drift-bottle histories ha provided confirmatory evidence.

To what extent the Varne current experiences 1932 have been due to a "buffering off" as it we caused by an extra urge of waters into the Southe North Sea from the north — remains to be decide suffice it here to remark that there is some eviden in support of the idea.

The collection of observations of salinity and te perature of the sea surface in the North Sea, Engli Channel and North Atlantic has been carried on hitherto, in accordance with the list given in Ra et Proc.-Verb., Vol. LXVI, 1930, p. 136. An agr ment has been reached between this country a France for co-operation in maintaining a new line observations between Folkestone and Dunkerque, which sea water samples will be taken weekly at fo positions on the route. Work on this line will be early in 1933.

Hydrographic observations in either the North S or English Channel have been made on eleven voya of the "George Bligh" and "Onaway" in each mo from May to December, except August. In June t study of the relationship between salinity distributi and water movement was continued, the work be done in co-operation with H.M.S. "Colne". On t occasion the observations were made further west the Channel than last year, between the meridi of Plymouth and the Isle of Wight. The remain of the observations were made in connection w investigations on plankton.

As usual, the samples have been titrated for salin at the Government Laboratory, London. Lists data, as they become available, have been tra mitted to the Bureau in Copenhagen from time to ti

rance. Regular observations of temperature and nity were made daily from the "Sandettie" light- at the surface and bottom 2 hours before and ours after highwater. The results will form the ct of a special publication.

loreover, both in the eastern part of the Channel also in the western North Sea numerous tempera- readings and water samples were collected the many cruises with the fishery patrol vessels on fishing boats, as enumerated in Section I rk at sea).

ermany. The regular observations have been tinued as before:

. On the lightvessels Borkum Reef, Norderney, ser, Minsenersand, Bremen, Elbe I, Elbe 4, Aussen- r and Amrumbank every 3 to 4 days, once at n and once at low water, surface observations of perature and salinity. At Borkum Reef and Elbe I simultaneous bottom observations of tempera- and salinity.

. In Heligoland roads on the same days as at the tships likewise temperature and salinity observa- s at the surface.

At 4 stations round Heligoland every fortnight he surface in 10 (15 or 20) m. and bottom-tem- ture and salinity observations.

On the route Cuxhaven—New York, as before, r-samples were also taken in the North Sea.

At the lightvessels noted under 1 the strength direction of the current were determined every ours, as also the time of the change of current. he observations noted under 2, 3 and 4 were sent openhagen for publication in the Bulletin Hydro- hique. Of the lightship observations those for and 1931 have been published, with an appen- containing observations not previously published the lightships Weser, Bremen and Norderney the years 1924—1928[1]).

pecial observations:

On a cruise of the "Poseidon", extending from 15 to May 2 in the German Bight, 72 hydro- hical stations with 247 temperature and salinity rvations, also 228 intervening stations with sur- *t* and *S* observations; further, numerous phos- e determinations were carried out.

pplementary to these investigations, at the light- noted under 1 and on the lightship Aussenjade, April 13 to May 7 daily *t* and *S* observations at high and once at low water.

From August 15 onwards, on the lightships Elbe 1, Elbe 4, Ausseneider and Amrumbank, as also in Heligoland roads, on the same days as before, water samples were collected not only for *S* determinations but also for determination of the alkalinity, to be continued for 1 year for the purpose of gaining information with regard to the relation of salinity and alkalinity in the mouth-area of the Elbe.

3. On a cruise of the fishery patrol vessel "Weser" from November 15 to December 14, 42 stations with 56 *t* and *S* determinations at the surface.

The results of the phosphate investigations in the German Bight in May 1931 have been published[2]).

Earlier observations on the alkalinity of the Southern North Sea from the years 1925—1930 have finally been worked up and published[3]).

The working up of the current observations at the lightship Borkum Reef has been brought to an end and the manuscript is ready for publication; a similar elaboration has been undertaken for the lightship Amrumbank observations. — In preparation: a publication on the hydrographical conditions of the south-eastern North Sea based on the lightship material and the observations of the "Poseidon" 1920—1932.

Holland. The regular temperature and salinity observations have been continued at three lightvessels and on the steamship route Flushing—Harwich, Rotterdam—London and Amsterdam—Hull. Further, in the first half of November surface and deep water observations in the Flemish Bight by the "Nautilus" at 16 stations between 52° N. and the line Dover—Calais.

Norway. On the steamship routes Bergen—Newcastle and Bergen—Rotterdam, weekly temperature and salinity observations were continued.

Scotland. The serial temperature and salinity observations obtained on both cruises of the "Explorer" have been submitted for inclusion in the Bulletin Hydrographique.

In May, 10 surface drift-bottles at each of thirteen stations were liberated. Of these 63 have been returned to date, 16 from strandings on the English coast, 18 from the west coast of Denmark, 8 from the Skagerak, and 21 from the coast of Norway. Of the 130 surface drift-bottles liberated at thirteen separate positions in the month of October, 24 have been returned so far and of these 20 came from the coast of Norway, the remaining 4 having been stranded on the west coast of Denmark.

[1]) Deutsche Seewarte: Meereskundliche Beobachtungen auf deutschen Feuerschiffen der Nord- und Ostsee. Hefte: 1, Year 1930. 2, Supplement. 3, Year 1931. Hamburg 1932.

[2]) Kalle, K.: Phosphatgehaltsuntersuchungen in der Nord- und Ostsee im Jahre 1931. — Ann. d. Hydrographie u. marit. Meteorologie. Bd. 60, H. I. 1932.

[3]) Zorell, F.: Beiträge zur Kenntnis der Alkalinität des Meerwassers. — Ibidem Bd. 61, H. I/II. 1933.

TRANSITION AREA REPORT
1932.

By

H. Blegvad, Chairman.

The co-operative work in 1932 mainly concerned the Herring and the Plaice.

As regards the Plaice the year-class 1932 (0-Gr.) was found to be considerably richer than normal especially in the Belt Sea (Fig. 1). The year-class 1931 (I-Gr.) was poorly represented in the Baltic and in the Belt Sea, and also rather poor at the coasts of the northern Kattegat (Fig. 2).

Fishing experiments for Herring fry were carried out in the autumn by Sweden and Denmark.

In the Belt Sea, the Sound, the Kattegat and the western Baltic the number of larvae was below the normal, whilst considerably great catches were taken in the waters off the coasts of Sealand, Möen and Falster.

Denmark.

Biology (Dr. Blegvad).

The vessels used for investigations in 1932 were as follows: S/S "Japetus Steenstrup" and S/S "Biologen" from March till the end of October, S/S "Dana" in April and a motor-boat in July and August.

Plaice Investigations.

Fishing experiments with the "Tog" (a fine meshed Ottertrawl) were — as in former years — carried out throughout the Transition Area from the Skagerak to Bornholm.

In the Belt Sea the stock was exceedingly small as was the case in most other places; only in the north western Kattegat and in the coastal waters of the Skagerak a more dense population of young fish (I—III-Gr.) was found.

Fishing experiments from a motor-boat for plaice of the 0-Gr. were carried out along the coasts of the Kattegat, the Belt Sea and the western part of the Baltic proper with Johansen's Young fish trawl from $^{11}/_{7}$—$^{30}/_{8}$. The investigations gave the very interesting result that the number of plaice of the 0-Group was exceedingly above normal in the southern Kattegat, the Sound, the Belt Sea and the western Baltic, in several places the quantity of fry was larger than that found in any former year. In the northern Kattegat the quantity of fry was normal.

The investigations concerning the races of the plaice have been continued.

In the month of April (7th—29th) about 107,000 kg. or 1,205,000 individuals of young plaice were transplanted from the Horns Reef Grounds to the Be Sea, the southern Kattegat, to the Sound and t western Baltic. Of the transplanted plaice 2000 we marked. Until January 1933 a total of 28.5 % we recaptured. The growth of the recaptured plaice this period averaged about 12 cm. Only small migr tions appear to have taken place. A considerab part of the plaice transplanted to the Sound we according to the marking experiments, caught Swedish fishermen, and a few of those put out the western Baltic by German fishermen.

During the winter of 1932—33 investigations fishermen's catches were made and it was found th about 37 % were derived from the transplanted plai

Flounder and Dab.

The usual investigations as to age, length, maturi and food were carried out. Special stress has be laid upon the study of the stock of dab and a pap concerning this subject is in preparation.

Cod and other Cod Fishes.

The cod and haddock caught by the "Tog" w investigated as to age, length, maturity, race a food. The fishery with Ringtrawl in spring showe rather rich occurrence of cod larvae in the Belt S in the Kattegat the number of cod larvae was ev more considerable, and also an unusually la amount of coal fish larvae (*Gadus virens*) was fou here. Later in August and September the you bottom stages of the 0-Gr. of cod were caught relatively large quantities. The number of lar and bottom stages of the 0-Gr. of haddock cau in the Belt Sea and the southern Kattegat was o small. In August and September an unusually r occurrence of bottom stages of the 0-Gr. of c fish (*Gadus virens*) was found in the Northern B Sea, the Southern Kattegat and the Sound. In course of the winter these young coal fishes, of average length of 20 cm., were caught in big quanti in the gears of the fishermen in the Sound.

Herring.

The location of spawning places, by means fishing experiments for the tiny larvae with the r trawl was carried out in the Kattegat, the Belt Sea the Baltic in spring as well as in October (see F 3, 4). Investigations concerning the amount of f

ailable for the herring in the waters between Möen d Bornholm have been continued in co-operation th the Plankton Laboratory (Dr. P. Jespersen).

Mackerel and Eel.

Forecasts of the yield of the fishery were published Aage J. C. Jensen in "Dansk Fiskeritidende".

Larvae of Spring Spawning Fishes.

During April and May fishing experiments were rried out throughout the area in order to examine the currence and frequency of the larvae of spring awning fishes (plaice, flounder, dab, cod and rring etc.).

Bottom Invertebrates.

Valuations of the bottom with Petersen's grab have en made throughout the area to the same extent in former years.

Plankton.

As in previous years vertical hauls with plankton of fine gauze and with Hensen net were under- en regularly from the light vessels Anholt Knob, ultz's Grund, and Halskov Rev.
ertical hauls with the Hensen Net have been made connection with the ring trawl fishery.

Water Pollution.

n several coastal waters the extent of the pollution sed by sewage water and by the outlets from various tories has been investigated. Only in the nearest nity to the outlets an injurious effect of the uence of sewage discharged upon the bottom ertebrates could be traced.

nsplantation and Marking Experiments with Cod.

n the Thisted Broad (Central part of the Lim- d) 8000 specimens (3000 kg.) of cod caught in southern Kattegat were liberated on March the l 1932. 200 were marked (with a slightly altered non silver mark). Until January 1933 39 % were ptured; the growth since the output was 10 cm. % were recaptured in the Thisted Broad whilst remaining 4 % were caught in other parts of the fjord.

Hydrography

(Professor Martin Knudsen).

ydrographical investigations have been carried in close connection with the biological investi- ons. The material collected consists of measure- ts of temperature, salinity and oxygen content tations where biological investigations took place. stigations were undertaken partly in fjords and ly in the open sea. The latter part of the material be published in the Bulletin Hydrographique.
rom the beginning of October hydrographical stigations in connection with plankton investi- gations have been undertaken at a station in the Sound off Snekkersten. The hydrographical investigations consisted in determinations of temperature, salinity, oxygen, phosphate, nitrate and ammonia at different depths from the surface to the bottom, undertaken as a rule two or three times monthly. It is hoped that these investigations can be continued for at least one year.

Measurements of temperature and salinity (with hydrometer) from Danish lightships and from coast-stations have been undertaken by the Danish Meteorological Institute as in previous years and will be published by the Institute.

Germany.

(Dr. S. Strodtmann and Dr. E. Fischer).

I. Investigations into the Stock of young Fish.

The control of the stock of young plaice and flounder in the district of the Oder Bank has been continued. Dr. Kändler has, for this purpose, undertaken cruises with a small fishing cutter during the months of June, September and October. This work was commenced three years ago and the results show very clearly the great fluctuations that are particularly noticeable in the stock of plaice.

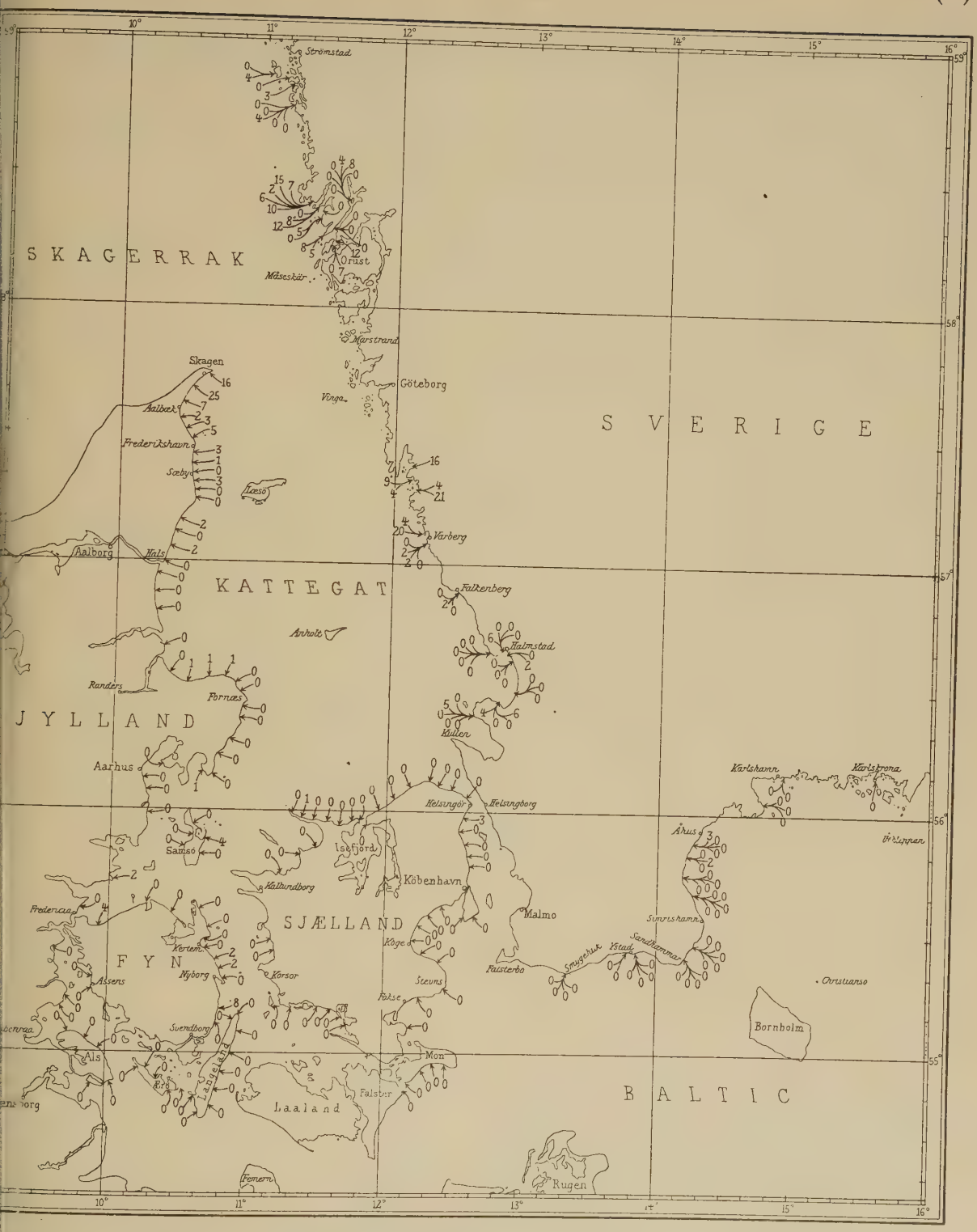
Plaice.

The plaice caught during the years 1930 to 1932 were distributed among the age-groups as follows:—

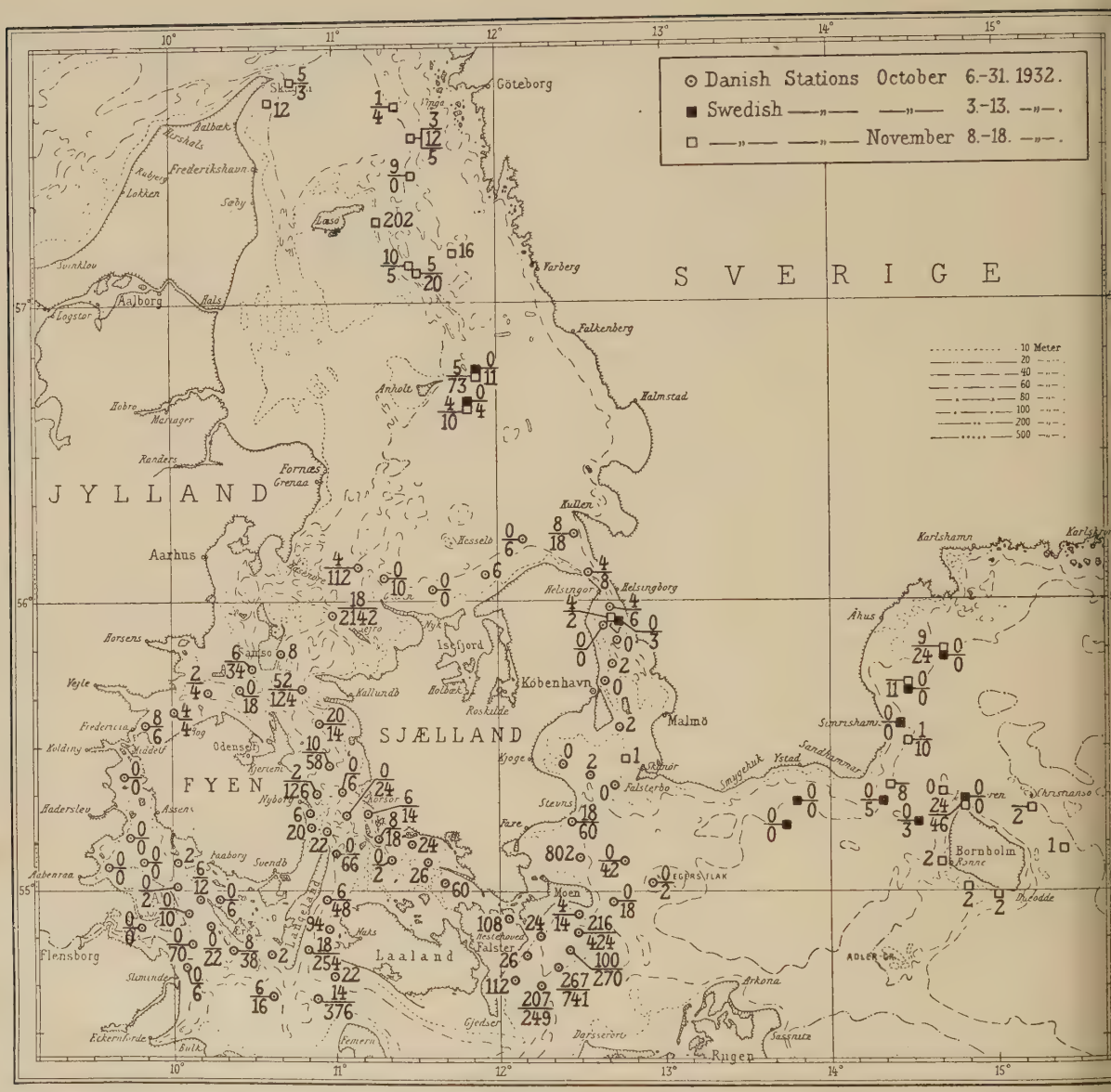
Age-Group	0	I	II	III	IV+
June—October 1930...	**346**	105	*1523*	290	5
May-June-Oct. 1931...	1	**626**	136	*964*	106
June-Sept.-Oct. 1932...	16	20	**1980**	83	*292*
Year-Class.....	..	..	**1930**	..	*1928*

The strength of the rich year-classes 1927, 1928 and 1930 is very noticeable as compared to the poor year-classes 1926, 1929 and 1931. Particularly the last-named class seems extremely poor, poorer even than the 1929-class. From the catch of plaice of the 0-group during autumn 1932 a better brood of young plaice than that of the previous year is to be expected. According to investigations by Danish and Swedish scientists the 1930 year-class has been very scarce on the Baltic coasts but it is extraordinarily well represented on the German coasts. It was caught regularly during the investigation-cruises, particularly to the East of Rügen on the western and north-western edges of the Oder Bank, where as early as the autumn 1930 it was recognised as the 0-group. We caught here, in June 1932, in 30 minutes' hauls, with the shrimp trawl up to 600 specimens. On the Oder Bank proper it did not appear in such numbers as for instance the rich 1928 year-class; and it did not penetrate into the Bight of Swinemünde in numbers worth mentioning. During the autumn of 1932 we

Fig. 1. Number of plaice of the 0-group (year-class 1932) taken per fishing unit in the summer and autumn of 1932. The fishing unit used w a 30 minutes' haul with Johansen's young plaice trawl.



Number of plaice of the I-group (year-class 1931) taken per fishing unit in ths summer and autumn of 1932. The fishing unit used was a 30 minutes' haul with Johansen's young plaice trawl.


Danish Stations October 6.-31. 1932.
Swedish —»— —»— 3.-13. —»—.
—»— —»— November 8.-18. —»—.
10 Meter
20
40
60
80
100
200
500
SVERIGE
JYLLAND
FYEN
SJÆLLAND
Laaland
Göteborg
Frederikshavn
Aalborg
Aarhus
Esbjerg
Varberg
Falkenberg
Halmstad
Helsingør
Helsingborg
København
Malmö
Ystad
Åhus
Karlshamn
Bornholm
Rønne
Rugen
Arkona
Flensborg
Svendborg
Odense
Nyborg
Nakskov
Stevns
Møen
Falster
Gjedser
Darsserort
Hesselø
Anholt
Læsø
Skagen
Hals
Løgstør
Randers
Grenaa
Fornæs
Kullen
Ringkøbing
Esbjerg
Vejle
Fredericia
Kolding
Middelf.
Assens
Faaborg
Nyborg
Korsør
Roskilde
Kallundb.
Holbæk
Nyk.
Isefjord
Kjøge
Rønne
Falsterbo
Smygehuk
Sandhammer
Simrishamn
Christiansø
Ertholm
Ertholmene
Thorsø
Ærø
Als
Sønderborg
Apenrade
Hadersleb
Tønder
Slumunde
Eckernförde
Bulk
Femern
Gjedser
Darsserort
Sassnitz
Ertholmene
Ertholm
Christiansø
Ærø
Thorsø
Nyborg
Nakskov
Stevns
Møen
Falster
Gjedser
Darsserort
Sassnitz
Arkona
Rugen
Bornholm
Rønne
Ystad
Simrishamn
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Falsterbo
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Halmstad
Anholt
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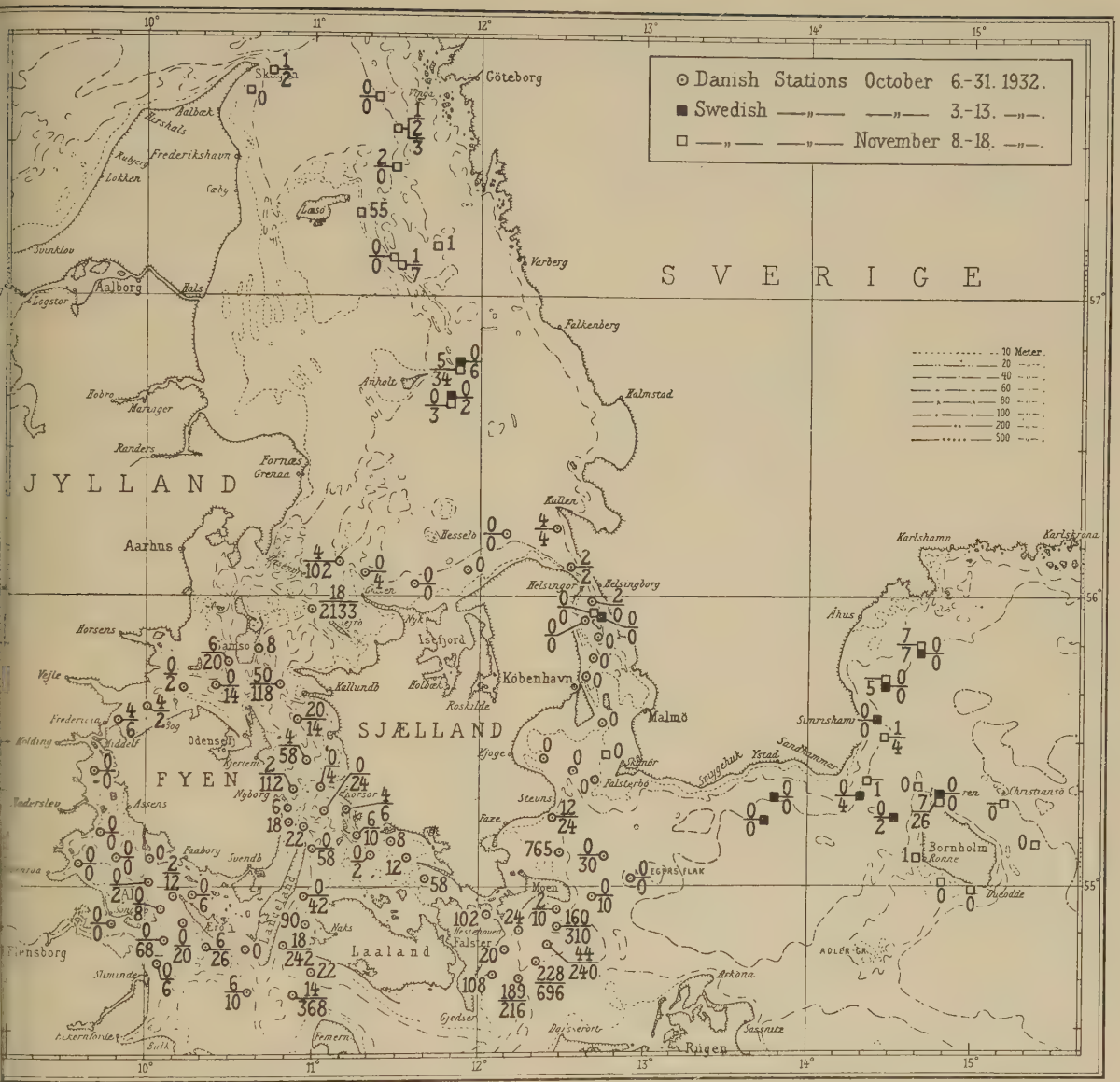

4. Number of herring larvae of 5—9 mms. length taken per 30 minutes' haul with a 2 metres stramin ring trawl in the autumn of 1932. — For Explanation of figures above and below the lines see fig. 3.

Age-Group	0	I	II	III	IV+
ne-September 1930...	184	927	*4548*	668	70
y-June-Octb. 1931...	..	785	786	*1338*	51
ne-Sept.-Oct. 1932...	146	551	*1105*	*1021*	290

The II- and III-groups appeared most frequently the catches. In the years 1930 and 1931 the rich 8-class predominates, firstly as the II-group and ing next year as the III-group. In 1932 both ups are almost equal as the 1930 year-class is slightly more numerous than the previous 1929 s. The relative figures for the three year-classes 1928, 1929 and 1930 in 30-minutes' hauls are: 182, 54, 68 (compare report of 1931). The year-class 1931 seems likewise to be no more than average.

A report by Dr. KÄNDLER on the question of introducing a close season for the spawning flounders was presented at the meeting in May 1931 (Veränderungen im Flundernbestand der Ostsee durch die Fischerei, Rapp. et Proc.-Verb. Vol. LXXVII).

II. Racial Investigations on Flatfish.

During the cruise in the Baltic in the spring of 1931 of the R.F.D. "Poseidon" racial investigations were

made, not only on cod, on which a report has already been given in the Report of 1931, but also on flatfish. In the various parts of the Baltic the number of rays of the anal fin was counted in a large number of the most frequent species, i. e. plaice, flounder and dab. The result of these investigations (mainly concerning mature fishes) is shortly as follows:—

As regards **flounder,** in the Baltic proper from Arcona to Danzig and Gotland an average of 40.5—40.3 was found — in other words nearly constant. Exceptions were the Stolpe Bank and the Bornholm Basin only, with 40.8 and 41.1 respectively. The average number in the Baltic proper is thus higher than in the western Baltic (about 40). In the North Sea the average number is about 42.

As regards **dab** the average numbers were 54.7—53.4, the higher value in the western waters, the lowest one in the Bornholm and Danzig Basins. Thus in the Baltic proper to the Gotland Basin a constancy exists in the number of rays of the anal fin in this species also. In the western Baltic, however, the average is more than 1 higher. In the North Sea the number is considerably higher.

In respect of **plaice** our investigations were concentrated on the area east of Rügen where the plaice population, so far, has been subject to few investigations only. We substantiated a ray-number of 52 in the anal fin, and it lies thus between the known values of 54 in the North Sea and 50 in the Belt Sea and western Baltic. In the section Oder Bank—Bornholm Basin variations in average numbers were arrived at for the various year-classes, viz. 51.5 for the 1927 year-class, 51.7 for the 1929 and 1930 year-classes, 52.1 and 52.2 for the year-classes 1925 and 1928 respectively. Both the last-named distinguish themselves from the other classes by a ray-number that is 0.5 higher. The relatively high value of 52.2 was also found in plaice from the Stolpe Bank as well as from the Gotland and Danzig Basins. Evidently the plaice of the Baltic proper thus form a special local group with 51.5—52.2 rays of the anal fin, and is, consequently, entirely different to the plaice of the Belt Sea and the western Baltic with 50 rays.

The special character of the plaice east of Rügen is also established by determination of vertebrae, the second racial sign. They incline highly towards a fusion of vertebrae that may be so marked, both in the first two and the last two vertebrae (in front of the Urostyle), that vertebrae appear with a single centre the complex nature of which is recognisable by accessory spinal processes only. Dr. KÄNDLER has written a paper in the "Journal du Conseil" on this phenomenon: the complex vertebrae. (Unsicherheiten bei der Bestimmung der Wirbelzahl infolge Verwachsungserscheinungen, Vol. VII. 1932). The average vertebral number of the plaice in the Baltic proper is 43.3 at the earliest stages of development which is considerably higher than that of the North Sea race (43.0): the mean of 43.3 is then reduced to 42.7 by fusion of the first or last pair of vertebral rudiments in a large number of individuals. The complex vertebrae are less frequent in the western Baltic; the average number of vertebrae will approach that of the North Sea race by giving the complex vertebrae a double value. The average vertebra number in the southeastern North Sea also is reduced to below 43 by the formation of complex vertebra in front of the urostyle. Vertebrae with accessory spinal processes were further observed in the following flatfish species: *Pleuronectes flesus, Pl. limanda Rhombus maximus, Rh. laevis.* This formation seem to be widely spread in fishes and leads to the assumption that the number of vertebrae in some group and in a certain sense is plastic, being affected b external factors.

The importance of exact determination of th vertebral number and of the occurrence of fusions i highly increased for the racial analysis through thi statement. It is undoubtedly profitable to use th number of rays of different fins as criterion, but th chief weight must be attributed to the segmentatio of the vertebral column in which the metamery of th body of the fish is most completely shown. Suc investigations into the most important species of fla fish in the Baltic have been commenced and popu lations of other waters will be included for com parison. A report on plaice is shortly forthcoming

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The market measurements for controling the effect of the protective measures regarding plaice an flounder were continued monthly on the variou coast places (see report of the Baltic Area).

Racial investigations were carried out on a greate material of flounder which come, in spawning con dition, every year in April and May to the "Grosse Jasmunder Bodden" off Rügen. The following mea values were found: Vert. Se. 35.20; An. 38.05; D 54.92. A comparison with samples from various part of the Baltic showed that the flounder of the Ja munder Bodden differs considerably from these. I was furthermore ascertained that the flounder of th Jasmunder Bodden are heavily over-aged. Defo mations of the bone structure were found in 29 %, which indicates that the flounder in this area wit low salinity lives on the limit of the zone of i occurrence.

For race investigations analyses were made of greater sample of spring- and autumn-herring origina ting from various fishing grounds of the weste Baltic, specially off Rügen. In the spring-herrings the western Baltic no uniform character was found The samples differ widely in total values of th vertebrae varying between 55.42 and 55.95. Th composition of the spring-herrings from Rüge however, is uniform, the mean value of which f Vert. S. is 55.65 to 55.70. In these lower vertebr values they differ from the spring-herrings fro Rügen viz. 56.06. It was further established tha there seems to be certain relations between th

ring-herrings of Rügen and those from the western ltic. No definite impression could as yet be gained the autumn-herrings.

Off the coast of Schleswig-Holstein and in con-ction with regular catches of the 0-group of plaice d flounder investigations were made into the food these young fish. Ecological researches showed at the size of the catch of the 0-group to some tend depends on the intensity of light near the ttom and the occurrence of food animals.

Norway.

(Dr. P. Bjerkan and Dr. A. Dannevig).

Eel.

As in 1930 and 1931 investigations have been ntinued on the effects of the eel-trawling in the astal districts from Hvaler to Kristiansand. All ta collected by means of the eel trawl have been unted and as regards the brood of the food fishes investigations have produced a good material. e investigations this year took place from June h to July 3rd. The prohibition in respect of eel wling at our coasts has, however, been kept in ce by our parliament and the matter is therefore no interest.

Sprat.

Samples of sprat were in the course of the year ected for investigation from the fishermen's ches from the Skagerak coast, particularly from Oslofjord. These samples showed a stock of sprat very varying sizes. As usual, the sprat of the er part of the Oslofjord showed to be larger than se farther out. The stock consisted mostly of ear old sprat, while in the late summer certain er sprats appeared in the outer districts which e considerably fatter than the west coast sprat. nkton conditions were found so good that it was n difficult to get the stomachs of the sprats tied.

Cod and other Cod Fishes.

t the State Hatchery at Flödevigen the hatching od was continued. The regeneration of the gonads testes of cod after spawning has been studied ugh the summer and autumn. The investigations o the influence of light and other surrounding ors upon the fry of cod have been continued. erial of cod, pollack, and coal fish has been cted and examined as to age, length, and racial acters.

Occurrence of Fish fry.

September and October fishing experiments were ed out in order to investigate the occurrence and uency of young of various fishes along the south-rn coast of Norway. The 0-Gr. of cod was found e poor.

Lobster.

The artificial rearing was continued and 20,000 lobsterlings were liberated into the sea. Measurements and markings of lobsters were carried out. —

Hydrography.

Hydrographical investigations were made in the coastal waters of Skagerak from June to December.

Sweden.

Biology (Dr. Arvid R. Molander).

The research ship "Skagerak" was commissioned for nearly nine months for biological and hydrographical researches. The motor-boat "Clupea", belonging to the Fisheries Laboratory at Lysekil, was mainly used for some minor investigations in the coastal waters, particularly concerning sprat.

Haddock.

The collection of statistical data from the port of Göteborg has been continued.

As in 1931, young fish hauls were undertaken in the Skagerak and Kattegat from the research ship "Skagerak", partly during the late May and partly in the beginning of July. The result of the May-expedition during which the total of 20 stations were visited shows that the occurrence of the pelagic young of haddock was certainly very poor, but evenly distributed in the Skagerak as well as the Kattegat as far down as off Kullen. At each station at least two horizontal hauls were made: one at the surface and one or two between surface and bottom. Of all 12 stations in the Skagerak only one (10 miles N.E. of the Skaw) showed absence of young fish. Of the 8 Kattegat-stations 4 were negative and 4 positive (the 3 of which were in the neighbourhood of Fladen, Anholt and Kullen respectively). None of the 20 stations, however, showed catches of any greater numbers. The highest number, 6 specimen, was obtained W.N.W. of Hanstholm on the 100 m. curve and a similar number 20 miles N. of the Skaw.

During the July expedition hauls were made at 20 different stations in the Skagerak. Not a single specimen of young haddock was caught which shows that the drift of pelagic young fish to Swedish waters had already discontinued earlier in the year and that the young fish had developed to the bottom stages.

The results of the year's July-expedition in conjunction with the experience gained during those of previous years seem to indicate that the 1932 year class will be of mean strength only.

A comparison of the trawlings carried out in the Skagerak during December 1932 shows (see Fig. 5) that the frequency of the 0-group is by no means extraordinary. Hauls of 1 hour's duration gave only about 45 specimens of that year-class (taken as an average of 10 hours' trawling). The maximum catch per hour was 70. These catches are very small as

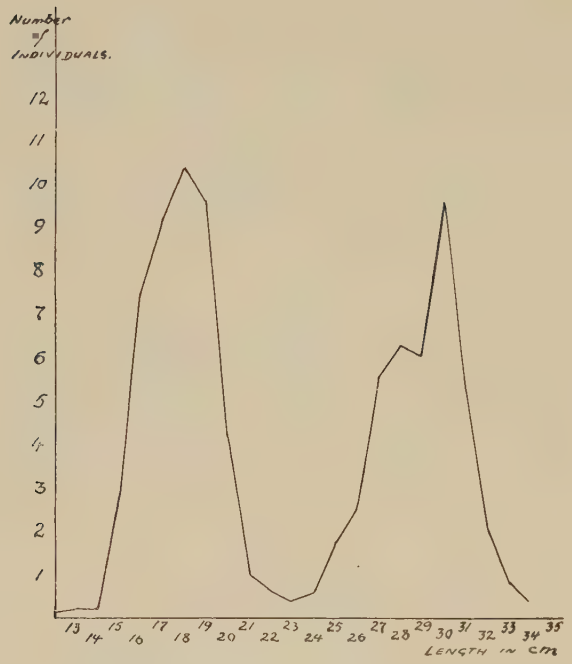


Fig. 5. Number of haddock caught in six trawl-hauls on Dec. 8th—9th 1932 near the station Højen III (Skagerak) reduced to 60-min. hauls.

compared with those taken at the same time and at about the same station the year before when the maximum number caught per hour was as much as 1200 specimens of the 0-group.

Although the available material is rather poor the result of the trawlings gives an indication to the effect that the 1932 year-class is not very good and decidedly inferior to the 1931 year-class.

Plaice.

During July 1932 trawlings were undertaken off the coasts of Bohuslän and Halland for the 0- and I-groups of plaice. In comparison with the catches of the 0-group in the years just preceding this year's catches were exceedingly good (see the table below) and form a record of the time since these investigations were started. Off the coast of Skåne, however, the plaice of this group were already less numerous but they occurred sporadically up to the region of Åhus.

Investigations into the stock of plaice in the Bornholm Basin were continued this year in order to follow the effects of protective measures on the stock.

Flounder.

The object of the 1932 investigations was to examine the distribution of the youngest year-classes off Skåne and Blekinge. As regards the flounder also the year seems to have been good although the year-class in question was, possibly, not quite as good as the 1930 one.

Flounder of the 0-group caught with Johansen's young fish trawl in 30 minutes' hauls.

	1929	1930	1931	1932
Östra Torp	5	75	2	59
Ystad	2	165	2	80
Ystad Saltsjöbaden	12	52	38	215
Sandhammaren	1	—	0	1
Örnehusen	10	3	3	36
Kivik	12	48	6	50
Stockbacken	7	30	1	16
Helgeån	2	13	1	27
Yngsjögrop	6	57	1	27
Hörvik	22	219	15	196
Karlshamn	4	72	53	130
Aspö	0	—	1	0

Witch.

Statistical data have been compiled during the year from the fishing port of Göteborg of various categories of witch landed.

The Swedish fishery of witch has, during later years, been subject to considerable changes. The major part of all Swedish-caught witch was previously taken in the Skagerak, but now up to 50 % or more is caught in the Northern North Sea in the neighbourhood of the Ling Bank, Fladen Ground and Bressay Shoal. The increase of the North Sea catch is illustrated by the following figures:— in 1926, 6.8 % were caught in the North Sea, during the years 1927 to 1931 the percentages were 14.6, 10.8, 20.9, 57.0 and 51.0 respectively. A considerable part of the North Sea catch is landed in Göteborg, a fact which has caused a considerable increase of the landings of witch during recent years. The total catch of witch in the Skagerak, on the other hand, has decreased perceptibly, even as regards catch

Number of specimens of the 0-group of plaice caught per 30 minutes' haul in a depth of 0.5—3 metres off the coast of Bohuslän and Halland.

Year	Month	Torekow	Båstad	Halmstad	Falkenberg	Varberg	Vändelsöfjord	Gullmarfj. outer part	Gullmarfj. inner part	Åbyfjord	Koster	Total
1932	July	31	186	24	155	275	175	49	114	29	98	1136 sp.
1931	—	3	16	10	4	1	27	34	3	3	1	102 -
1930	October / August	—	5	0	0	4	3	20	0	7	1	40[1]) -
1929	August	35	3	2	0	15	32	90	22	22	—	221 -

[1]) On the coast of Halland in the beginning of October, on the coast of Bohus in August—September.

per boat, in spite of introducing minimum size measures in 1927. Possibly this fact is connected with the increased fishery in the North Sea on the grounds mentioned which are the principal spawning grounds for the witch. Spawning of any importance, namely, does not take place in the Skagerak and an intensive fishing in the North Sea on the spawning grounds may influence the stock of spawning witch to such extent that the recruiting of the stock in the Skagerak, mainly coming from the North Sea, may be strongly affected.

Sprat.

The sprat investigations have been continued on an enlarged scale. During June—July extensive trawlings for sprat's eggs and fry were made along the coast of Bohuslän for eggs and larvae of the sprat, and the material collected was examined. As in former years, the presence of a special spawning district was again substantiated in the Uddevalla fjords, while spawning of importance was not found in the Bohuslän fjords. The drift of sprat eggs towards the coast was very strong in several of those fjords, and in June this drift took place as far north as the northern Bohuslän where last year sprat eggs were not found at all.

Throughout the year an extensive material of sprat was collected for race and age determinations. Treatment of this material has been done, partly, as the material was collected. The work has first of all had the object of determining the value of the characteristics recognized to distinguish the fjord race from the open sea race.

At the end of May and beginning of June the Fisheries Laboratory at Lysekil carried out experiments with sprat nets outside Gullmarfjord in order to collect spawning sprat; some of the experiments were successful.

Herring.

The "Skagerak" commenced, on the 3rd October, trawling for herring larvae in the southern Baltic. Hauls were made at 8 stations in the time October 3rd to 10th, partly in the Åhus bay, partly on the line Ystad—Arcona and partly north and west of Bornholm. The result was very poor. Herring-young were caught at two stations only, west of Bornholm, and 2 and 3 specimens only. Various investigations on samples from different places in this area showed that the herring was not yet in the spawning stage; and since it thus was proved that the spawning period had not yet even commenced, the trawlings were moved to the Kattegat. Neither there the spawning period had commenced as both trawlings and samples of driftnet caught herring showed. At a new expedition to the Kattegat on November 8th to 12th, trawlings were made on 11 stations between Anholt and Vinga as well as north east of the Skaw. On all stations young herrings were encountered, although in very small quantities. On two places only the catch was greater, viz. at a depth of 14 m. east of Læsø, where 202 specimens were caught in a depth of 10 m., and at Anholt Knob where 73 specimens were caught in a depth of 35 m. (see Figs. 3 and 4).

An intended new visit to the southern Baltic could not be realised because the "Skagerak" was engaged on another expedition.

Young Fish.

A combined review of the occurrence of pelagic young fish in the North Sea, the Skagerak and the Kattegat in the summer months is being prepared by the Fisheries Laboratory's plankton department. This report is based on the trawling material collected since 1922 during a series of years of witch and haddock investigations carried out onboard the "Skagerak".

Plankton.

The experiments, partly started already last year with the object of investigating the extent of the assimilation of phytoplankton algae at various steps of the visible spectrum, have been continued. The results reached have proved difficult to judge, owing to great physical-optical difficulties. It is hoped that these difficulties may be removed so that the experiments can be taken up again.

Literature.

A. R. Molander: Förekomma olika skarpsillraser i Bohuslän skärgård och utanför dens kust. Ny Svensk fiskeritidsskrift 1932, häfte 6.

A. R. Molander: Der Flunderbestand in der südlichen Ostsee und der Einfluss. den die Fischerei auf ihn ausübt. Rapp. et Proc. Verb. Vol. LXXVIII, 1932.

Hydrography.

In the Kattegat observations of the internal waves by means of recording boundary gauges mounted from submarine hydrographic stations have been carried out during several weeks in the late summer and in November. Complete records of the boundary waves were obtained which show a semidiurnal character. An analysis after the M_2 and S_2 tidal periods has given considerable amplitudes for the sine-curves which do not, however, cover the whole of the waves recorded. The results will be published shortly.

Hydrographic soundings along cross- and length-sections of the Kattegat were carried out from the "Skagerak", before, during and after these observations.

Lightship observations carried out from three points in the Kattegat have been continued during the year and will be published in "Fyrskeppsundersökningar".

The Research Station at Bornö, from which the continuous observations of the internal movements in the sea have been carried out according to programme, has been acquired as State property and been provided with electric lighting, central heating and new tools and instruments from a liberal grant given by Alice and Knut Wallenbergs Donationfund.

BALTIC AREA

1932.

By

K. A. Andersson.

In accordance with the programme adopted in 1932 the herring, the salmon and the flounder were the main objects of the work during 1932.

The investigations of the different countries bordering the Baltic were as follows.

Denmark.

Danish research work was carried out in July (12th—17th) from the "Japetus Steenstrup" in the waters around Bornholm.

Plaice, Flounder, Dab and Cod.

Fishing experiments with a hand push net were carried out at the west, south and east coast of Bornholm, and the catch per fishing unit (1 man in 1 hour) of youngs of flat fishes was as follows:—

at Rönne (West coast):
106 flounder of the 0-Group (mean length 1,8 cm.).
4 plaice of the 0-Group (3—5 cm.).
at Hasle (West coast):
606 flounder of the 0-Group (mean length 2,1 cm.)
2 plaice of the 0-Group (3—4 cm.).
at Hammerhavnen (West coast):
400 flounder of the 0-Group (mean length 1.9 cm.).
1 plaice of the 0-Group (4 cm.).
at Arnager (South coast):
240 flounder of the 0-Group (mean length 2.0 cm.).
No plaice.
at Due Odde (Southeast corner):
31 flounder of the 0-Group (mean length 2.0 cm.).
No plaice.
at Balka (East coast):
208 flounder of the 0-Group (mean length 1.9 cm.).
3 plaice of the 0-Group (3—$3^1/_2$ cm.).

During the fishing in 1931 only 1 plaice in all of the 0-Group was caught, whilst in 1928 no less than 28 were caught per fishing unit. The hand push net fishing thus indicates that the 1932 year-class (as well as the 1931 year-class) was comparatively poor in this part of the Baltic — at any rate far from being so rich as the 1928 year-class.

Fishing experiments were carried out with the eel-tog in the waters round Bornholm; the plaice, dab and cod caught were subjected to age-analyses as well as to investigations of stomach contents.

Herring.

Samples of herrings from the waters round Bornholm have been collected regularly from the beginning of July through the year in order to examine the quantity of their stomach contents. Compared with the year 1931, the percentage of herrings with food in the alimentary canal was continually much larger in 1932. (See the accompanying graphs). This fact is of considerable interest because the herring catch at Bornholm in the year 1931 was unusually poor, the herrings being lean and meagre.

Samples of herring caught East and West of Bornholm were subjected to investigations regarding age and maturity; they were about 3 years old and the majority were spawning.

Hauls were made with the ring trawl East of Bornholm and a few tiny herring larvae were caught; of other food fishes no larvae were taken.

Valuation of the Sea Bottom.

In order to follow the variations in the amount of fish food several bottom samples were taken with Petersen's 0.1 m.² bottom sampler in connection with the fishing experiments.

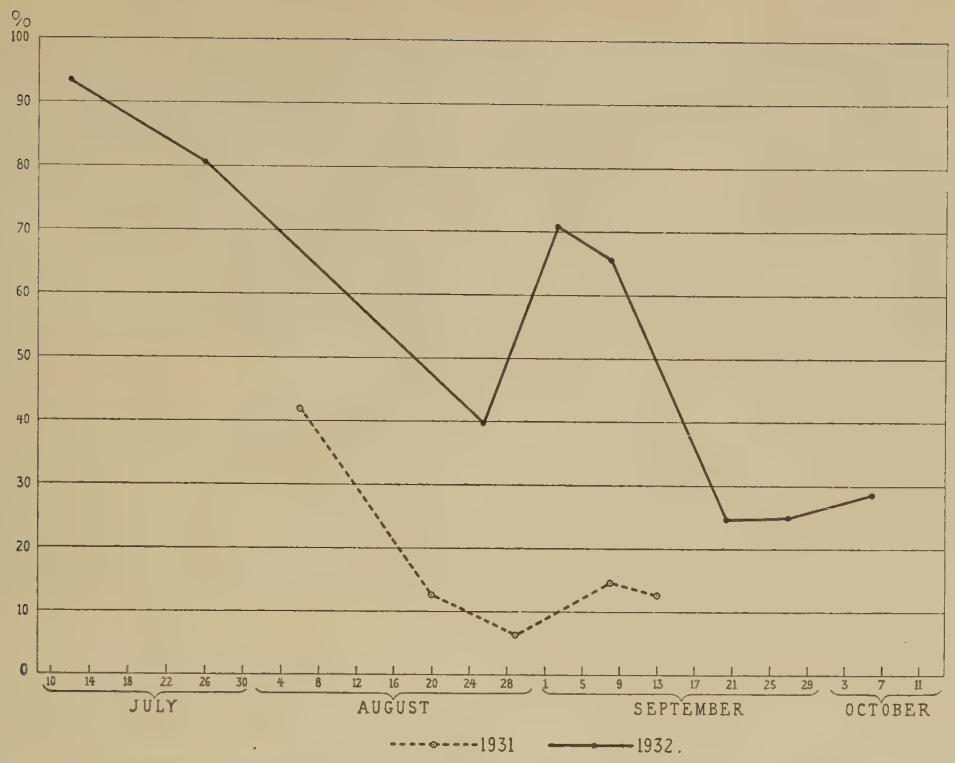
Plankton.

Vertical hauls with the Hensen Net were made in the waters round Bornholm in order to continue the researches regarding yearly variations in the amount of food available for the herring.

Hydrography.

Hydrographic investigations were carried out in connection with biological investigations from the R.S. "Biologen" in the waters north and east of Bornholm in July 1932. The investigations comprised determinations of temperature and salinity at different depths. The observations will be published in the Bulletin Hydrographique.

At the surface at Christiansö, near Bornholm, the Danish Meteorological Institute has made daily observations of temperature and salinity (with hydrometer). These observations will be published in the annual report of the Institute.



Percentages of Herrings with Food in the Alimentary Canal at Bornholm in 1931 and 1932.

Finland.

Biology.

Material for scale-analysis of Salmon from the rnio, Kemi, Oulu, Kymi and Kokemäki rivers. rking of young salmon in the Kokemäki and adult mon in Kemi rivers was carried out.
Statistics of the seals killed in the Gulfs of Bothnia l Finland were collected.

Hydrography.

. Regular observations were made as follows:—
. Surface temperature daily, surface salinity every day, temperature and salinity at different depths ry 10th day at 27 coast stations and 10 lightos.
. Surface temperature and salinity by liners from land to Denmark.
Currents at three depths three times daily at ightships.
Registration of the sea-level at 17 stations and dings of the sea-level at 20 stations.
Records of ice conditions in journals and Sketchs at about 100 stations and by all Finnish ships he Baltic.
A hydrographical cruise was made in July 1931 he Baltic north of Gothland, during which 71 ions were made. On this cruise samples for the rmination of chlorinity, oxygen and alkali reserve were collected. In addition determinations of hydrogen-ion-concentration content were made on board.
3. Special investigations for the study of the mixing in the sea were made at the end of July 1932 in the North Quark and during August 1932 in the Gulf of Finland.

Germany.

The main activity again concerned the regular investigations into the flat-fishes in the Baltic landing ports in order to study the influence of protective measures. 100 measurings were undertaken last year at various Baltic ports and some 59,000 plaice, flounder and dab were thereby thoroughly examined. A total of 223 investigations have so far been made and some 120,000 fish have been examined.

In addition to these measurings 19 cruises have been made last year with fishing-cutters in order to obtain information on that part of the catches which, being unmarketable, is not brought ashore. Such cruises are also valuable from other points of view as they give a good view of the vitality of the several kinds of fish under various conditions and also they give some idea of the distribution of the three most important kinds of flat-fish on the various fishing grounds. Furthermore they are of great help in collecting interesting observations on the gradual tribute of the new year-class to the marketable stock of fish.

The investigation into the occurrence of the 0-group of plaice, flounder and turbot on the coast of East Pommerania were also continued.

In connection with the racial investigations of the herring in the western Baltic and near Rügen the autumn herring from Kolberg were examined.

A final report on marked sea-trout, liberated during April 1930 in the Baltic off Kolberg was prepared (see the report of the Salmon and Trout Committee).

Latvia.

Statistics.

Statistical work was regularly continued by the Board of Fisheries and Pisciculture for 72 districts like in former years. The data regarding the fishing boats were further completed. Also data regarding the number of seal killed along the sea shore were compiled. Statistics of the export of fish and fish preserves were continued.

The data for 1931 are published in the "Bulletin Statistique des Pêches Maritimes de Lettonie — Anné 1931", edited by the chief of the Board of Fisheries and Pisciculture, Mr. V. Miezis. The statistical materials for 1932 are ready for publication.

Biology.

The experiments in the cultivation of Salmonid fishes in the State Fish Hatchery at Tome were continued.

Investigations of Pleuronectid and Salmonid fishes were carried out as in former years at the Fishery Laboratory (Ministry of Agriculture). Also investigations of lavaret were continued by the Fishery Laboratory.

The Hydrobiological Station of the Latvian University (Director: Prof. Dr. Embrik Strand) continued its researches regarding the fish and the plankton of the waters bordering the Latvian coast and of the Gulf of Riga (cfr. "Rapp. & Proc. Verb. LXXXI. p. 232). Among others a paper was published by B. V. A. Berzins: "Das Plankton der lettischen Terminfahrt im Frühjahr 1928 (Rigascher Meerbusen und Baltisches Meer)" in "Folia Zoologica et Hydrobiologica" Vol. IV, Nr. 1. p. 68—102, (1932).

Hydrography.

Two hydrographical cruises with the research vessel "Hidrografs" were carried out by the Fishery Laboratory (Ministry of Agriculture) during June and October in the Baltic and the Gulf of Riga. Determinations were made at several points and depths (0—140 metres) regarding the temperature, salinity, hydrogen-ion-concentration, oxygen, carbonic acid, nitrogen compounds (ammonia, nitrate), calcium, magnium, phosphate, sulfuric acid and the contents of iodine.

By the Hydrobiological Station of the Latvian University surface observations of the sea regarding t° and $S^0/_{00}$ were regularly carried out approximately as in 1931 (cfr. "Rapp. et Proc. Verb." LXXXI p. 232), although those on the routes Kiel—Riga and Kiel—Danzig—Riga were discontinued, but instead of these observations were made on Hälsingborg—Riga and Hälsingborg—Danzig—Riga routes. The observations were published in the "Bulletin Hydrographique" and in "Folia Zoologica et Hydrobiologica" Vol. IV, Nr. 2 (1932) and Vol. V, Nr. 1 (1933).

The Marine Department (Ministry of Finance) continued observations of water level along the coast of Latvia at 10 points. The results of these observations in Daugagriva (Dünamünde) and Liepaja (Libau) for the year 1931 have been published in the "Bulletin Hydrographique pour l'année 1931". A chart of the Latvian coast from Ainazi (Haynash) to Salacgriva (Salismünde) is published by the Department.

Various Investigations.

The Fishery Laboratory (Ministry of Agriculture) continued the chemical and technical researches on fish and fish products. Also the investigations of the pollution of rivers by cellulose and oil industries were continued.

The works of the Commission for the Investigation of the Pollution of the River Daugava (Düna) were closed and the results prepared for publication.

The Hydrobiological Station of the Latvian University has among others continued the researches mentioned in "Rapp. et Proc.-Verb." LXXXI p. 232.

Poland.

Hydrography.

The hydrographical researches were reorganised. The State Meteorological Institute and the State Central Hydrographical Office were united and a new plan and programme of researches was constructed. As a base for the marine hydrographical work will serve the State Meteorological Institute, branch office in Gdynia. The investigations will begin in the near future.

The regular observations of the temperature and salinity at different depths in two points near Hel were continued, in connection with observations of the water level and also of the currents measured with an Ekman-Merz current-meter.

Fishery Investigations.

a. Experimental investigations upon the possibility of the use of the ordinary herring-trawl for the

mmercial herring fishery in the Baltic Sea, were carried t near Bornholm during July and in the Gulf of anzig during August and September 1932. The neral results of such investigations were negative, t they were of great use in determining the com-sition of the stock of herrings in the Gulf of Danzig. was found that the shoals of "herrings" were com-sed of: 1) small young herrings, 2) small and young dividuals of *Clupea alosa*, 3) adult individuals of rrings, 14 to 18 cm. long of the spring and autumn ces and also 4) of large individuals belonging to the ring race, the so-called "giant herrings", not dif-rent from the race described by HESSLE from the edish fjords.

b. In connection with the development of the sprat hery, by means of a sprat-trawl, the analysis of e catches of sprat was made and published in the urnal du Conseil.

c. Investigations concerning the composition of the ck of flatfishes near the Polish shore were carried t. The most striking fact revealed was the successive sappearance of the common dab. These species in 28 formed 37 % of the catches of flatfish, in 1930 %, but in 1932 5 % only.

d. Experiments were made with a new type of a awl destined for the stony grounds.

e. Analyses of the catches of salmonid fishes, con-rning the age, dimensions and weight of fishes were ade.

f. Sea trouts entering the Vistula were studied.

g. Marking experiments with Salmon and Trout re continued.

h. The natural history of the sturgeon entering the stula was studied and a preliminary note on this bject was published.

Biological researches.

a. Data were collected for a zoogeographical chart ncerning the bottom fauna in the Baltic near the lish shore.

b. The periods of sexual activity of the components the fauna near the Polish shore were determined.

c. Qualitative plankton investigations were com-nced.

Sweden.

The Research Vessels.

During the year under review investigations at sea re made by the motorboat "Eystrasalt" and the earch vessel "Skagerak".

The "Eystrasalt" was kept in continuous commis-n from the beginning of June until the end of vember and worked along the entire eastern coast Sweden.

The "Skagerak" made a cruise to the Baltic from end of August to the middle of October for hydro-phical work in the region east of Gotland, during rly four weeks, and biological work in the Born-m region.

Flounder.

In October material of the flounder was collected at many stations in the region between Bornholm and Sweden especially for the study of the influence of the fishery upon the stock of this fish.

In July and in the autumn the stock of the flounder at the coast of Gotland was studied. In the region off the northern part of this island the stock was very rich and good catches were made.

Many fishing experiments were made to catch the young stages. The catches of the 0-group were rich at Gotland and Öland and in the Kalmar Sound.

Also in the Bornholm region the catches of the 0-group were greater than in the previous year.

Plaice.

In the autumn (Sept.—Oct.) the stock of plaice was investigated in the southern Baltic. Samples of the young stages were collected.

Turbot.

Marking experiments of this fish were continued in the southern part of the Baltic. As a rule the turbot do not undertake any great migrations in the Baltic. Samples of young stages were collected in the southern and middle parts of the Baltic.

Cod.

During the year under review many fishing experiments were made in different regions for the study of the stock of cod. During the previous years the codfishery along the Swedish Baltic coast has been very poor, but in 1932 the catches were as a rule good. Specimens in the length of 25—40 cm. (3—4 years) were abundant.

Herring.

The herring investigations were continued according to programmes of previous years. Many samples from different parts of the Swedish Baltic coast were collected for studies as to races and age-composition. The year-class from 1929 seems to be rather rich and the fishery has therefore increased in 1932.

During September and October a great number of hauls with the 2-metres ring trawl were made at many stations off the east coast of Sweden in order to collect herring larvae, but the catches were small.

Salmon and Sea Trout.

Also in the year 1932 the salmon fishery off the coast was generally very rich.

Scale samples were collected from different parts of the Baltic coast for the study of age-composition of the stock, and many specimens were measured especially from the catches in shallow water on the southern coast of Sweden.

Plankton.

The quantitative investigations of the zooplankton has been continued at a great number of stations in different parts of the Baltic and at different seasons.

Hydrography.

In the Baltic an expedition with the "Skagerak" was undertaken which lasted for nearly four weeks from the end of August to the 20th of September. Current measurements with recording current metres suspended from submarine hydrographic stations, (submerged buoys with double anchorage), and also from the anchored ship were carried out S.E. of Gotland, Lat. 56°44′ N. Long. 19°37′ E. depth 130—140 m., when the weather permitted. The result confirmed those obtained at the same locality in 1931, viz. that the current, set up by the wind becomes deflected into a rotating current which completes a revolution in $14^1/_2$ hour and is tentatively assumed to be an "inertia current". Hydrographic soundings with temperature and salinity measurements were made at the locality of these observations and on the way.

Observations of temperature, salinity and current as well as of the meteorological elements have been made regularly from five lightships stationed in the Baltic proper and in the Gulf of Bothnia. The results will be published in the "Fyrskeppsundersökningar" of the Swedish Commission.

PLANKTON COMMITTEE

1932.

Denmark.

By Prof. Ove Paulsen.

1. Researches on the food of the herring in Icelandic waters have been finished, and a paper by Dr. P. Jespersen has been published in the "Meddelelser" of the Danish Commission.

2. Researches on the food of the herring in the waters around Bornholm, in the Baltic, by Dr. P. Jespersen. By this work, which is carried out in collaboration with the Danish Biological Station, an attempt has been made to understand the variability of the herring-fisheries at Bornholm. — A weekly sample of about 50 herring stomachs has been investigated; until April 1933 about 2000 stomachs. The amount of feeding herring (herrings with stomach-content) decreases in the autumn but increases again in March, April. Copepods are found in the stomach-contents all the year round, Mysidae and Cumaceae mostly in winter; in early spring several young-fish (Gadus, Ammodytes) were found in the food of the herrings. (Compare Transition Area report for this year).

3. Two papers on the plankton fauna and flora of Ringkøbing Fjord, by Dr. P. Jespersen and Mag. Einer Nielsen, have been prepared and are ready for press.

4. A paper by Mag. Einer Nielsen on the assimilation, measured by oxygen-production, of plankton algae at Frederikshavn has been published in the "Meddelelser" of the Danish Commission.

5. Mag. Einer Nielsen took part in "Dana"s cruise to Icelandic waters. Plankton was collected at all hydrographical stations round Iceland and on the cruise from Iceland to East Greenland and back, partly by vertical hauls with a fine-meshed Nansen net and partly by preservation of water samples from depths of 0, 10, 25 and 50 m. This work concerns a total of 70 stations during the period from end of June to end of July.

Although counting of the quantitative samples has not, by a long way, been completed it is possible to give a short review of the distribution of the plankton. While the plankton at oceanic stations south of Iceland mainly consists of *Coccolithophoridæ* the plankton off the south- and south-west coasts of Iceland is mainly composed of diatoms and naked flagellates. The following may be specially mentioned: *Chaetoceros cinctus*, *Asterionella japonica*, *Leptocylindrus minimus*, and *Nitzschia delicatissima*. Each of these species is generally found in numbers of 100—1000 per cm.^{3}.

At the north-western corner of Iceland, too, a rich plankton population was found mainly consisting of naked flagellates and diatoms, especially *Chaetoceros* species (*C. debilis* up to 350 per cm.^{3}).

Samples from the Denmark straits have not yet been counted but the net samples show that diatoms are dominating. Samples from some of the stations along the ice border near the coast of East Greenland have been counted, and all of them seem to confirm the presence of a comparatively rich plankton population. In addition to the flagellate *Phaeocystis Pouchetii*, found in numbers of 1500 cells per cm., numerous diatoms were present, particularly *Thalassiosira spp.*, *Chaetoceros spp.*, *Fragilaria oceanica* and *Nitzschia delicatissima* are often found in numbers up to 100 per cm.^{3} (Compare North Western Area report for this year).

The countings were made by aid of Utermöhl

ersed microscope. Numerical comparisons of ıntings by this procedure with countings after ıtrifugation will be made.

. Mag. Einer Nielsen has commenced an estigation of the plankton-production in Øresund e Sound). Once a week plankton is collected at kkersten (about 3 km. south of Helsingør), tly with nets and partly quantitatively as water nples from depths of 0, 5 and 15 m. At the same ıe the sea water's content of Cl, O_2, NO_3, and O_5 was determined and the production of matter water with the natural plankton content was ermined using oxygen-production as a measure. addition, laboratory-experiments were made in er to investigate the influence of light on assi- ation. Light was measured by the Boysen- nsen method, the unity being 1 lux, the light one Hefner, filtrated through a red-yellow filter, order that the red light only is measured. The duction of matter was slight in autumn and compensation-point goes upwards with decreasing light: from 6—7 m. in October to 1—2 m. in cember.

n March the production was very small and in ril the whole water column was nearly without nkton and no Phosphates and Nitrates were sent.

. Collections of Zooplankton and Microplankton n Icelandic waters have been worked up.

. Weekly plankton samples have been collected n three Danish light-ships.

. Plankton from the coast of East Greenland has n collected by different expeditions.

ogramme for 1933.

he Danish Plankton Laboratory will continue, as as means permit, the lines of investigation ribed above under Nos. 2, 5, 6, 7, 8.

England.

our plankton cruises were made during 1932 as ws:

May. Northern North Sea in connection with ing food investigations. Rough weather prevented onclusion.

and 3. **June and early October.** Plankton of lish East Coast area. The object was to chart the r-soluble matter content of dried zooplankton. ıne it was found that the area in which the "fat" ent was greatest coincided with the area being d by herring drifters working from North Shields. corroborated less extensive work of the same re carried out in 1926. The October values were r than in June but again the highest values were ıe northern part of the area. The ether-soluble er values were, however, relatively higher in the nern part of the area than they had been in June.

Late October. Location of possible concentrations of phytoplankton. No *Phaeocystis* was found but a very dense and extensive patch of *Rhizosolenia styliformis* was found to the east of the southern edge of the Dogger Bank.

Each month from June to the end of the year, with the exception of August, a line of six stations was worked between Flamborough Head and the South-west Patch of the Dogger Bank. It is proposed to make a monthly routine observation over a number of years in order to measure the annual and periodic incursions of important zooplankton forms, particularly *Calanus finmarchicus*.

Herring food investigations. The stomachs of 7951 herring were collected from the Shields and Great Fisher Bank area and the contents examined.

Programme for 1933. With the exception of an additional cruise in April, which it was not possible to undertake last year, the programme is a repetition of that for 1932. Our object is to be able to compare the results of a series of years to see what fluctuations or unusual occurrences take place.

Germany.

A. Biologische Anstalt auf Helgoland.

Die Zahl der Untersuchungsfahrten, die die Biologische Anstalt im Laufe eines Jahres in ein grösseres Gebiet unternehmen kann, ist wegen der hohen Kosten gering, gewöhnlich sind es 2 Fahrten im Jahr (mit dem »Poseidon«).

Hierbei sind die Plankton-Untersuchungen nicht die wichtigste Aufgabe, die Fahrten dienen vielmehr in erster Linie den Untersuchungen über den Bestand erwachsener Fische. Dieser Zweck bestimmt den Termin und das Gebiet der Fahrten. Die hierbei angestellten Plankton-Untersuchungen verfolgen wiederum in erster Linie das Ziel einer Verbesserung unserer Kenntnisse über die Verbreitung und Mengenverhältnisse der pelagischen Brut der Fische (Eier und Larven), und zwar sind dies Arbeiten, die sich auf eine Reihe von Jahren erstrecken sollen und die noch nicht abgeschlossen sind. Soweit Zeit und Kräfte es erlauben, werden aber auch die übrigen mit den Fischbrut-Netzen gefangenen Makroplanktonten untersucht, über deren Vorkommen, Verbreitung und Mengenverhältnisse unsere Kenntnisse noch sehr mangelhaft sind. Nebenbei finden ausserdem Untersuchungen über das Mikroplankton (Netzplankton) statt, während das Nannoplankton in den letzten Jahren wegen anderer Arbeiten nicht berücksichtigt werden konnte. Die Nannoplankton-Untersuchungen sollen jedoch 1934 wieder aufgenommen werden. Das Makroplankton wird zur Zeit bearbeitet von Prof. Mielck und Dr. Künne, das Mikroplankton von Prof. Mielck und das Nannoplankton von Prof. Wulff.

Im Übrigen sind Arbeiten über die Methoden der Planktonfischerei (insbesondere bezüglich der Fischbrut) teils abgeschlossen, teils noch im Gange.

Im Folgenden wird über die Plankton-Untersuchungen des Jahres 1932 berichtet.

I. Untersuchungen über das Makroplankton der südlichen Nordsee, besonders der Deutschen Bucht.

An Bord des »Poseidon« wurden im April—Mai 1932 die seit mehreren Jahren in Gang befindlichen Arbeiten fortgesetzt, ebenso auf einigen Fahrten des Helgoländer Stationsschiffes »Augusta«, die in der Umgebung von Helgoland und zwischen Helgoland und den Mündungen der Elbe, Weser und Jade ausgeführt wurden, und ferner auf einer Fahrt mit dem Fischereischutzkreuzer »Weser« in die südwestliche Nordsee bis zum Eingang des Kanals im November—Dezember 1932.

Zweck der Untersuchungen ist folgender:

Feststellung der Verbreitung und Mengenverhältnisse der grösseren Planktonten in ihrer Abhängigkeit von den hydrographischen Verhältnissen (Temperatur, Salzgehalt und vor allem Strömungen etc.), Untersuchung der ökologischen und biocoenotischen Zusammenhänge, besonders im Hinblick auf die Beziehungen der Planktonten zu den planktonischen Fischeiern und -Larven und den erwachsenen Fischen (als Nahrung oder Nahrungskonkurrenten, Feinde etc.).

Als Geräte für den Fang der Planktonten wurden in erster Linie benutzt:

1. Quantitative Vertikalnetze:
   a) Hensens Eiernetz, Seidengaze Nr. 3.
   b) Helgoländer Larvennetz, Seidengaze Nr. 0.
   c) Grosses Vertikalnetz (mit Aufsatz), seidene Griessgaze, Nr. 22.
2. Horizontalnetze:
   a) Petersens Jungfischtrawl (»Knüppelnetz«).
   b) Helgoländer Brutnetze.

II. Untersuchungen über das Mikroplankton Netzplankton (Gaze 20) der Deutschen Bucht.

Die ebenfalls seit mehreren Jahren in Gang befindlichen und noch nicht abgeschlossenen Untersuchungen wurden hauptsächlich an Bord des »Poseidon« ausgeführt.

Zweck der Untersuchungen ist folgender:

Feststellung der Verbreitung des Kleinplanktons besonders in ihrer Abhängigkeit von den Meeresströmungen. Auf diese Weise können die Strömungen durch die für sie charakteristische Planktonzusammensetzung bzw. an für sie besonders charakteristischen Arten erkannt werden.

Das Mikroplankton wird auf möglichst vielen Stationen des Untersuchungsgebietes durch Horizontalzüge mit dem kleinen Oberflächen-Netz aus Seidengaze Nr. 20 (nach Apstein) gefangen und qualitativ verarbeitet. In erster Linie wird darauf geachtet, bestimmte besonders charakteristische »Leitformen« festzustellen. Eine genauere quantitative Untersuchung des Mikroplanktons mit Hensen'schen Methoden ist wegen Zeit- und Personalmangels gegenwärtig nicht möglich.

Diese Arbeiten erfolgen im Zusammenhange mit den gleichzeitigen hydrographischen Untersuchungen. Dadurch, dass das Wasser am gleichen Ort und zu gleicher Zeit physikalisch-chemisch und bezüglich seines Plankton-Charakters untersucht wird, ist es möglich, sich ein Urteil zu bilden über den Wert der physikalisch-chemischen und der planktologischen Herkunfts-Bestimmung des Wassers. Dabei hat sich schon in sehr vielen Fällen eine deutliche Übereinstimmung der Ergebnisse beider Methoden ergeben. In manchen Fällen ist sogar die planktologische Herkunfts-Bestimmung des Wassers eindeutiger als die hydrographische Bestimmung, da die verschiedenen Wassersorten sich oft durch ihren Plankton-Charakter schärfer unterscheiden lassen als durch ihre Temperatur- und Salzgehaltswerte.

III. Untersuchungen über Verbreitung und Häufigkeit von Phaeocystis in der Deutschen Bucht.

Während der »Poseidon« Fahrt im April—Mai 1932 wurden die schon im Vorjahre begonnenen Arbeiten über Verbreitung und Häufigkeit von *Phaeocystis* fortgesetzt.

Zweck der Untersuchungen ist festzustellen, ob die Vermutung richtig ist, dass die Heringe und Sprotten und vielleicht auch andere pelagische Tiere (z. B. ältere Fischlarven, Copepoden u. a. Crustaceen) die Gebiete, in denen starke *Phaeocystis*-Wucherung stattfindet, meiden. Dazu ist es notwendig, Zeit und Ort der Wucherungen kennenzulernen. Das geschieht durch Bestimmung der Anzahl von *Phaeocystis*-Kolonien in einer gewissen Menge geschöpften Oberflächen- und Tiefenwassers auf jeder Station des befahrenen Gebietes.

Die bis jetzt vorliegenden Ergebnisse lassen den Schluss zu, dass im Frühjahr das vor den ostfriesischen Inseln gelegene Küstenwasser sehr viel grössere Mengen von *Phaeocystis* aufweist als die anderen Teile der Deutschen Bucht. In diesem Jahre konnten wir erneut, und zwar diesmal zahlenmässig, nachweisen, dass *Phaeocystis*-Wucherungen sogar die verhältnismässig weitmaschige Seidengaze des Hensen'schen Eiernetzes so sehr verstopfen, dass die für Fischeier und Fischlarven und andere Arten gewonnenen Zahlen oft viel zu niedrig sind. Dieser Nachweis liess sich führen durch Vergleichsfänge mit einem neuen, weitmaschigeren Modell des Vertikalnetzes (sog. »Larvennetz«).

Die Untersuchungen werden fortgesetzt.

IV. Versuche zur Methodik der Horizontalfänge mit Petersen's Jungfisch-Trawl ("Knüppelnetz")

Es ist bekannt, dass für eine gründliche Bearbeitung des Makroplanktons, besonders der Fischbrut, zur Gewinnung des Materials neben Fängen mit quantitativen Vertikalnetzen solche mit grösseren Horizontalgeräten, z. B. mit dem Jungfischtrawl, nicht entbehrt werden können. Dabei ist es erwünscht, dass die Fänge mit diesem Gerät auch quantitativ — soweit das bei Horizontalnetzen eben möglich ist — untereinander und mit den Fängen der Vertikalnetze wenigstens bis zu einem gewissen Grade vergleichbar sind. Voraussetzung hierfür ist eine vollständige Gleichmässigkeit in der Ausführung der Fänge unter gleichmässige

erücksichtigung aller durchfischten Wasserschichten; enn nur dann sind die Fangergebnisse vergleichbare rössen. Besonders wichtig ist eine stets gleichleibende Anwendung des Gerätes nach feststehender ethodik im Hinblick auf die Zusammenarbeit ehrerer Forscher.

Bei der meist gebräuchlichen Anwendungsweise des ngfischtrawls, wie sie bisher auch von uns geübt urde, lässt man das Gerät eine bestimmte Zeit lang . B. 10 Minuten) in der Tiefe oder an der Oberfläche s Meeres nachschleppen, um es dann einzuholen. ei dieser Art des Fanges wird aber eine bestimmte asserschicht bevorzugt, nämlich die Schicht, in elcher das Gerät bei gestoppter Winde gefischt hat. eim Tiefenfang werden die darüber liegenden asserschichten nur beim Einholen des Netzes durchcht, also beim Gesamtfang vernachlässigt. Bei einem ng an der Oberfläche oder in mittleren Schichten erden die darunter liegenden Schichten garnicht rücksichtigt. Solche Fänge ergeben also keine hinichende Stichprobe des vorhandenen Planktons im gensatz zu den Vertikalfängen, welche alle befischn Wasserschichten gleichmässig berücksichtigen.

Dr. Russell, Plymouth, empfiehlt »Oblique hauls«, ren Art bekannt sein dürfte; es sind Fänge, die an r Oberfläche beginnen und stufenweise bis zum eeresboden und wieder aufwärts bis zur Oberfläche hren. Dadurch werden alle Wasserschichten einigerassen gleichmässig gefischt. Besser dürfte es sein, e Prof. Mielck in einem auf der Tagung der Intertionalen Meeresforschung 1932 vorgelegten Zirkular Ueber zum Fang von Heringslarven geeignete Geräte«) pfiehlt, den Fang am Boden beginnen zu lassen. Seitens der Biologischen Anstalt sind jetzt Versuche macht worden mit sogen. Schrägfängen (im Gegenz zu den von uns »Stufenfänge« genannten oblique uls von Russell). Dabei wird das Netz bei fahrenm Schiff bis zum Boden herabgelassen. Es wird eimal soviel Leine ausgegeben, wie die gelotete assertiefe beträgt. Sofort nach Erreichen des Meeresdens wird bei weiterfahrendem Schiff wieder einholt. Es werden also keine Stufen, bei denen das tz bei gestoppter Winde eine Zeit lang fischt, zwischen geschaltet. So werden alle Wasserschichten ichmässig befischt. Diese Methode, bei der allergs die Einzelheiten noch festgelegt werden müssen, den Vorzug grosser Einfachheit, was sehr wesentist im Hinblick auf eine stets gleichmässige wendung unter verschiedensten Bedingungen und verschiedenen Forschern.

Ein abschliessendes Ergebnis der Versuche liegt h nicht vor. Doch ist jetzt schon ersichtlich, dass Schrägfänge im allgemeinen genügend viel Material ern (nötigenfalls kann man in kurzer Zeit 2 oder lche Fänge hintereinander machen) und auch sonst empfehlen sind.

V. Prüfung von Vertikalnetzen.

Die im Auftrage der Plankton-Kommission der ernationalen Meeresforschung ausgeführte verchende Prüfung der Fangfähigkeit verschiedener Modelle von vertikal fischenden Plankton-Netzen wurde abgeschlossen. Das Gesamtergebnis liegt vor in Rapp. et Proc.-Verb. Vol. LIX, 1929 und Vol. LXXXIII, 1933.

VI. Untersuchungen über die Nahrung von Fischlarven.

Die Nahrungsuntersuchungen wurden fortgesetzt, vorallem an Herings- und Plattfischlarven der Deutschen Bucht.

B. Hydrobiologische Abteilung des Zoologischen Staatsinstituts in Hamburg.

Von E. Hentschel.

1. Allgemeines.

Die Hydrobiologische Abteilung des Hamburger Zoologischen Instituts, die unter Leitung von Prof. Hentschel noch vorwiegend mit der Bearbeitung des Planktonmaterials der »Meteor«-Expedition beschäftigt ist, hat im Jahre 1932 mit Planktonuntersuchungen begonnen, welche in das Arbeitsgebiet der Internationalen Kommission fallen. Diese Untersuchungen sollen sich zunächst hauptsächlich auf die Grössenordnungen des Nanno- und Mikroplanktons beziehen. Sie sollen vorwiegend die Beziehungen des Phytoplanktons zu dem Zooplankton von Copepodengrösse sowie die hydrographischen Bedingungen der Entwicklung dieser Planktonsorten betreffen. Sie sollen also weder nach fischereibiologischen Gesichtspunkten orientiert sein, noch die Frage der Phytoplanktonproduktion in erster Linie behandeln; es wird jedoch erwartet, dass sie nach beiden Richtungen hin von Nutzen sein werden.

2. Untersuchungen in der Elbmündung.

Herr Dr. K. Thiemann hat eine Bearbeitung des Planktons von Flussmündungen zum Abschluss gebracht, in der eine Untersuchung der Elbmündung im Vordergrunde steht. Es wurden Längsfahrten bis in die Deutsche Bucht hinaus ausgeführt und dabei Wasserproben in Abständen von wenigen Minuten geschöpft, ferner auf den Feuerschiffen vor der Elbmündung durch je eine volle Tidenperiode hindurch, also wenigstens 13 Stunden lang, stündlich Wasserproben entnommen. Aus diesen Proben wurde das Plankton von je 1000 $cm.^3$ sedimentiert und gezählt. Die Ergebnisse dieser Zählungen zeigten deutlich, dass zwischen den Feuerschiffen III und IV ein Planktonmaximum liegt, das sich mit den Tiden in regelmässiger Weise aufwärts und abwärts verschiebt. Ausserdem ergab sich durch vergleichende Untersuchung einiger südatlantischer Flussmündungen, dass ähnliche Verhältnisse wohl allgemein an Mündungen, in denen Tiden wirksam sind, bestehen. Es liess sich ein allgemeines Schema des Verhaltens des Planktons in Flussmündungen zum Salzgehalt, zur Gestaltung der Mündung und zur Tidenbewegung entwerfen.

Die Arbeit erscheint in Band XII der »Wissensch. Ergebnisse der Deutschen Atlantischen Expedition (»Meteor«-Expedition)«.

3. Untersuchungen an den Küsten von Island.

Im August/September 1932 nahm Prof. Hentschel an einer Fahrt des Fischereischutzbootes »Weser« nach Island teil. Es wurden Nannoplanktonuntersuchungen ausgeführt durch Zentrifugierung von je 30 cm.³ Oberflächenwasser an Bord und Zählung in frischem Zustande. Ferner wurden an jeder Station 2000 cm.³ Oberflächenwasser nach Konservierung sedimentiert, hauptsächlich zum Zweck der Zählung der Metazoen. Gleichzeitig machte Herr Dr. K. Kalle hydrographische und Nährstoffuntersuchungen. Die Arbeiten erstreckten sich auf die Hin- und Rückfahrt, eine Rundfahrt um die Insel und wiederholte Befahrung von Teilen der Südküste.

Die Analyse von etwa 30 Proben rund um Island liess mit grosser Deutlichkeit die Unterschiede des Planktons im atlantischen und im arktischen Wasser erkennen. Die Verteilung der beiden Planktonsorten und ihre Abgrenzung gegeneinander entsprach durchaus den bekannten hydrographischen Verhältnissen. Weniger klar, doch in manchen Punkten auch gut verständlich erwies sich der Einfluss der wechselnden Küstenbedingungen auf das Plankton. Die wiederholten Untersuchungen an der Südküste zeigten starke, wohl jahreszeitlich bedingte Unterschiede der Planktonbevölkerung.

Ein Vergleich der Metazoenbevölkerung, wie sie sich aus den Sedimentierproben ergab, mit dem Nannoplankton zeigte, dass die Maxima und Minima im allgemeinen einander nicht entsprachen, vielmehr die auffälligsten Maxima des Nannoplanktons mit denen der Metazoen abzuwechseln schienen.

Ein Bericht über diese Untersuchungen erscheint in den Berichten der Deutschen Wissenschaftlichen Kommission für Meeresforschung (N. F.) Bd. VI.

4. Untersuchungen über die Ernährung der Copepoden.

Es war beabsichtigt, im Fischereigebiet an der Südküste von Island Untersuchungen über die Ernährung der Copepoden anzustellen. Sie kamen, da die Reise der »Weser« abgekürzt werden musste, nicht zur Ausführung. Es wird jedoch beabsichtigt, sie bei nächster Gelegenheit wieder aufzunehmen.

Vorbereitende Untersuchungen werden zur Zeit an Copepoden des Süsswassers ausgeführt. Einerseits werden Versuche im Laboratorium angestellt (Fütterungsversuche, Hungerversuche u. a.), andererseits werden seit einer Reihe von Monaten regelmässig die Darminhalte der Copepoden der Niederelbe (*Eurytemora*) mit den Nannoplanktonverhältnissen ihrer Umgebung verglichen.

Ferner sind auch Untersuchungen über die Bedeutung der Copepoden als Nahrung der Jungfische in der Niederelbe ihrem Abschlusse nahe.

Irish Free State.

During the past year Macroplankton collections with vertical hauls of the standard net were made, except when bad weather prevented, on all hydrographical stations on the north and south coasts of Ireland. The collections have been examined for larval Euphausians and have been stored for future reference. (August 1932, 24 hauls, November 1932, 14 hauls, February 1933, 12 hauls).

Ten series of vertical hauls with a closing net were made at four successive depths (100—75 m., 75—50 m., 50—25 m., 25—0 m.) at intervals between 4 p.m. on 10th August and 12.30 p.m. on 11th August, 1932. The total depth was 100 m. These hauls have not yet been worked out.

It is proposed to carry on similar investigations, including serial vertical hauls by day and night, during the coming year.

The aim of this work is, ultimately, to throw light on the feeding movements of pelagic fishes but an accurate knowledge of the movements of the plankton itself and its distribution in time and space is a necessary preliminary.

Scotland.

By Alexander Bowman.

In reply to your circular letter regarding the resolution passed by the Plankton Committee in Copenhagen on June 21st 1932, I have to inform you that a summary of the cruises undertaken by the Research Vessel "Explorer" is given in the Report of the Northern North Sea Area Committee for 1932[1]). As in former years, routine plankton observations were made at selected stations on all cruises, the itineraries to the offshore grounds being undertaken chiefly to maintain the continuity of observations on the herring and haddock species. Special attention has been given to the larval and post-larval fishes occurring in the plankton collections and more particularly to the herring and haddock. While notes have been made on the general characteristics of the plankton special attention has been given to the study of the Biology of *Calanus finmarchicus* in the north-western area of the North Sea.

It is proposed to continue the plankton investigations in 1933 on the same line.

Norway.

By Prof. H. H. Gran.

In connection with his investigations on the biology of the cod, Mr. Oscar Sund has made observations on the nitrate, phosphate and oxygen content of the waters around Lofoten and collected water samples for quantitative plankton determinations, following the same plan as in previous years. The plankton material from the year 1930 is now worked up at the University of Oslo by Miss Ebba Gjeruldsen. The results will be published in 1934.

[1]) See page 25.

Mr. T. Soot Ryen has made similar observations
ıd collections on monthly cruises during the whole
ear in the area around Tromsø, particularly in the
alsfjord and Malangen Fjord, since 1930. The
ankton material from the years 1930—1931 has
en worked up by Miss Karen Ringdal, University
Oslo. The report is ready for publication this year.
he diatoms show two yearly maxima, one in April
ıd another in July-August (Malangen) or in Sep-
mber (Balsfjord). The *Ceratia* have their maximum
September, and the *Pontosphaera* in July-
ıgust.

Professor H. H. Gran and Mr. Trygve Braarud
ere in 1932 engaged by the International Passama-
ıoddy Fisheries Commission, St. Andrews, Canada,
r an investigation of the hydrographical and bio-
gical conditions of the Bay of Fundy and the adja-
nt parts of the Gulf of Maine through the whole
owth season (April to September). The hydro-
aphical report will be published by Dr. Watson,
ronto, the report of the observations on the
emical conditions and on the phytoplankton by
AN and Braarud, the zooplankton by Dr. Charles
SH and Dr. Martin A. Johnson, the biology of the
ring by Michael Graham, Lowestoft. In con-
ction with this work a cruise in the outer part of
Gulf of Maine was arranged by Dr. Bigelow with
"Atlantis" in the first week of August, 1932. A
nt report on the results of this cruise by Henry B.
ELOW (general results), Norris A. Rakestraw
emistry), H. H. Gran (phytoplankton) and Selman
Waksman (bacteriology) is in print in the Bio-
cal Bulletin.

The results of the investigations on the phyto-
nkton and its relation to the chemical conditions
be reported to the Plankton Committee during
meeting in Paris, as they represent not only the
t thorough investigation of a larger area than
erto made, but also have some general interest.
n the deeper parts of the Gulf of Maine, as it is
wn from Bigelow's extensive investigations
ugh a series of years, the phytoplankton consists
pring (April to May) of a rich diatom plankton
Thalassiosira nordenskioeldii as the dominant
ies. As soon as the nitrates and phosphates are
ced to very low values by the metabolism of the
oms, and the waters get stratified by heating of
surface layers, the diatoms are succeeded by
tia, which are dominating through the whole
mer together with *Pontosphaera huxleyi* and a
e population of *Rhizosolenia alata*. The phyto-
kton and the oxygen content have both their
mum at 20 to 30 metres depth. Over Georges
k (at the mouth of the Gulf) the water layers are
d vertically by turbulence, and a rich diatom
kton — with *Rhizoslenia alata* as the dominant
es — is growing also during summer. The diatoms
venly distributed from surface to bottom (60 m.)
a slight maximum at 20—30 m., where also a
mum of oxygen content was found. Along the
of Maine neritic diatoms grow through the whole
season, various species succeeding each other; here some vertical mixing is caused by tidal currents. The water is less transparent than in the open Gulf, and the maximum of oxygen is found nearer to the surface.

The Bay of Fundy is an area characterized by strong turbulence of the waters, caused by tidal currents. The transparence of the water is low, as much detritus is washed out by the tides from the shallow muddy beaches near the head of the bay. After a spring growth of diatoms, consisting here mainly of *Thalassiosira nordenskioeldii* and *Porosira glacialis*, has grown and formed a dense population in the outer parts of the Bay in April and May, the whole Bay in June is extremely poor on phytoplankton in spite of the fact that the nitrate and phosphate content of the surface layers have been renewed by the strong turbulence to show high values.

The only possible explanation of this extraordinary situation may be that the turbulence prevents the diatoms from accumulating in the lighted surface layers. In the rather closed Passamaquoddy Bay, connected with the Bay of Fundy by narrow passages, the water is more stratified, and here the *Thalassiosira* plankton is succeeded by a rich growth of *Chaetoceros debilis*, continuing to grow till the end of July. Other factors may work in the same direction such as the fog, dominating this area during summer, and the feeding of the zooplankton, but certainly the turbulence must be the main factor to keep the phytoplankton poor during the first part of the summer.

In August the waters near the mouth of the Bay are again slightly stratified and here also a fair growth of diatoms takes place with *Skeletonema costatum* and *Asterionella japonica* as the dominant species. These species seem to have their centre of distribution in the inner part of the Bay, as they can be followed along the whole coast of New Brunswick, but they accumulate as a dense population only in the outer part. At the same time, waters from outside, running into the Bay along the coast of Nova Scotia, introduce another plankton community, with *Chaetoceros constrictus* as the dominant species, and here also *Peridinium triquetrum* occurred in great numbers at the surface.

In September the same communities were found, but the numbers were rapidly decreasing. In some years a number of southern oceanic species are introduced with the inflowing currents along Nova Scotia viz. in September 1931 *Rhabdosphaera stylifera*. In 1932 this influence was less marked.

* * *

In 1933 no new extensive investigations will be organized, as our time will be required for finishing the reports of the investigations in 1932 and previous years. Mr. Braarud will, after his return from

America, be engaged on an investigation of the pollution of the Oslo Fjord by the drainage from the city in correlation to the growth of phyto-plankton and bacteria. Professor GRAN will continue his experiments on the question of iron and manganese as limiting factors to the growth of the plankton diatoms.

From the Biological Laboratory of the University, Oslo, the following papers on plankton have been published:

JOHAN T. RUUD: On the Biology of Southern Euphausidae. (Hvalrådets skrifter, Nr. 2.)

PER OTTESTAD: On the Biology of Southern Copepoda. (Hvalrådets skrifter, Nr. 5.)

Dr. RUUD is further working with plankton Euphausids from the Mediterranean and the Bay of Biscay, collected by Danish expeditions, particularly the "Thor"-Expedition, in 1912—1918.